

RESIDENTIAL NEW CONSTRUCTION CHARACTERISTICS AND PRACTICES STUDY

Appendix

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The MBSS Analysis Tool

The MBSS Analysis Tool is a special software tool for summarizing site characteristics. This section describes how to use the software and the underlying principles.

Purpose of the Software

MBSS is a powerful way to summarize the information contained in the Statewide Residential Lighting and Appliance Saturation database. Here are some examples of the type of statistic that you may obtain:

- The average efficiency of various types of equipment
- The saturation of high efficiency equipment
- The average age of different types
- The sizes of equipment
- The percentage of homes with equipment having particular efficiency levels, age ranges, sizes, etc.
- The average annual kWh energy use of refrigerators.
- Insulation and window types

This type of information can be developed for all sites, or for various classifications of sites. Using the standard queries provided in the database, the sites can be classified by any combination of the following variables:

- Utility (PG&E, SCE, SDG&E or SMUD),
- Type of residence
- Total People in Household
- Total Adults in Household
- Total Heated Floor space
- Age of Residence
- Household Income
- Renters and Owners
- Stratum

You can also use Access to design new queries to classify sites by any additional characteristics that you might want.

MBSS calculates all averages to reflect the characteristics of interest and the underlying sampling, so that the resulting statistics are representative of the population of residences in California. The software has options for calculating sample sizes and error bounds (at the 90% level of confidence).

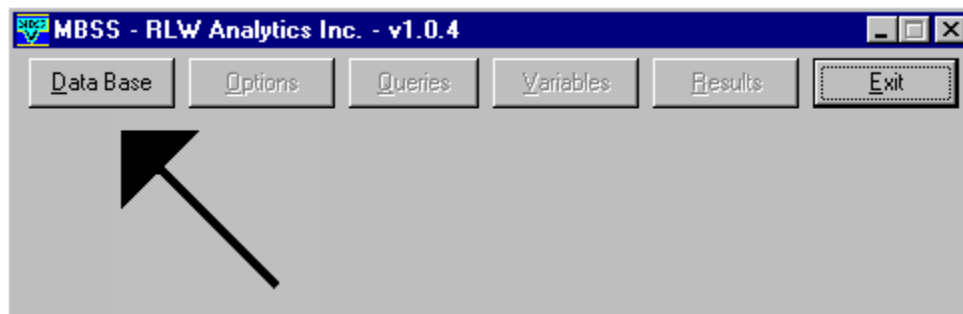
MBSS has been used to prepare all of the information in this report. MBSS can be used to extract additional information from the underlying Access database using the queries that have been provided in the database. In addition, MBSS can be used to analyze new queries to provide even more specialized information.

Using the Software

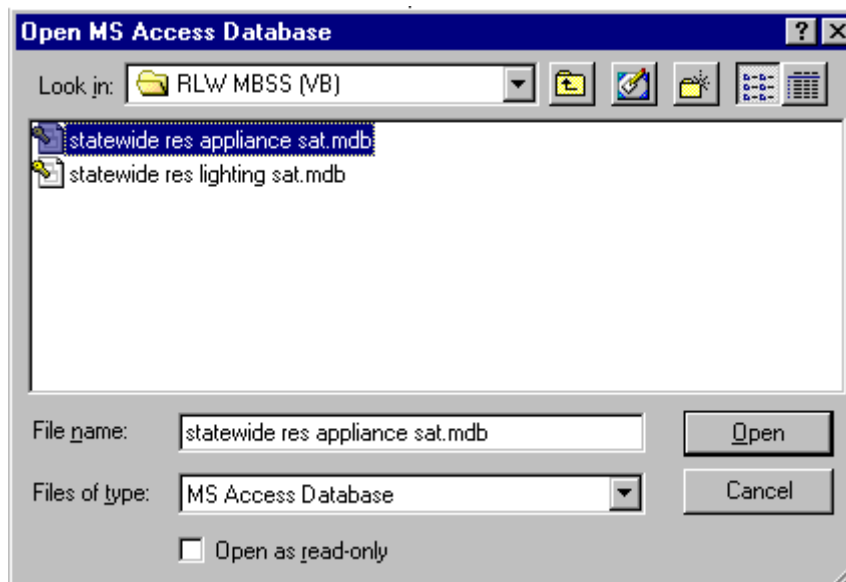
MBSS can be installed on any computer running Windows 95 or Windows NT and MS Access. An installation disk is available. The program is activated from the start menu >Programs>RLW Tools >MBSS (VB)>MBSS or with the shortcut on the desktop. When the software is run, the main menu will appear with the Data Base button enabled.

Data Base

Click on the Data Base button to select the Microsoft Access database containing the data to be analyzed. Note that MBSS will write the results to this database.

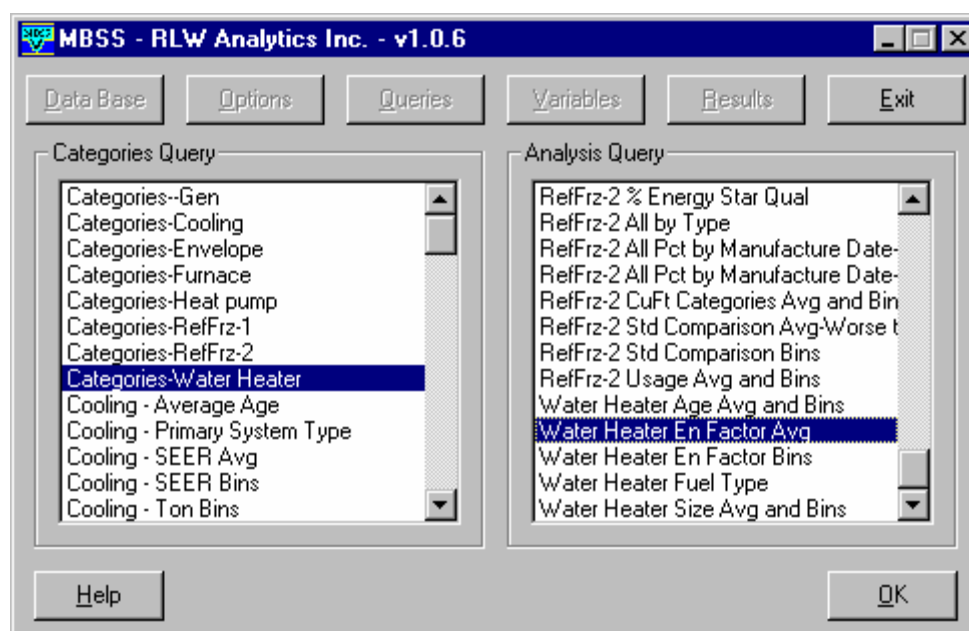


Installation of the MBSS will place two databases in the folder **Program Files\RLW MBSS (VB)**. One contains only lighting related data called **statewide res lighting sat.mdb**. The other database, **statewide res appliance sat.mdb** is comprised of data for all other aspects of the study. Click on the Data Base button to select the Microsoft Access database containing the data you would like to analyze. Note that MBSS will write the results to tables contained the same database that contains the data.



Queries

Click on the Queries command button to select your Categories and Analysis queries.



Selecting the Categories Query:

Appliance Categories Queries

The categories Query selection box will list the categories queries that are available in each database. For the appliance database, a query named 'Categories--Gen' will be displayed at the top of the list. This general category query is used for all analysis queries that do not require their own categories query. In the appliance database, clothes dryers, dishwashers, self-standing freezers and washing machines are used in conjunction with the Categories—Gen query. All of the analysis queries available for use with this category query begin with the prefix gen-

If you wish to analyze data related to cooling systems, envelope (insulation, frame construction and window type), heating systems (furnaces), heat pumps, refrigerator/freezers (not self standing freezers), or water heaters, you need to choose the categories query for that classification. All category queries have a suffix that denotes the equipment classification, such as categories-cooling that is used for all cooling system related data.

There are two categories queries for Refrigerator Freezers. "Categories-RefFrz-1" is used for information regarding the primary refrigerator freezer in each residence. "Categories-RefFrz-2" is used for information regarding for secondary refrigerator freezers.

Lighting Categories Queries

The lighting database has three categories queries:

'Categories – Gen' which is used for most all lighting related analysis except:

'Categories – All Rooms', which is used for the analysis of lamp type by fixture type by room type.

"Categories – Switches", for analysis of kitchen switches

Selecting the Analysis Query

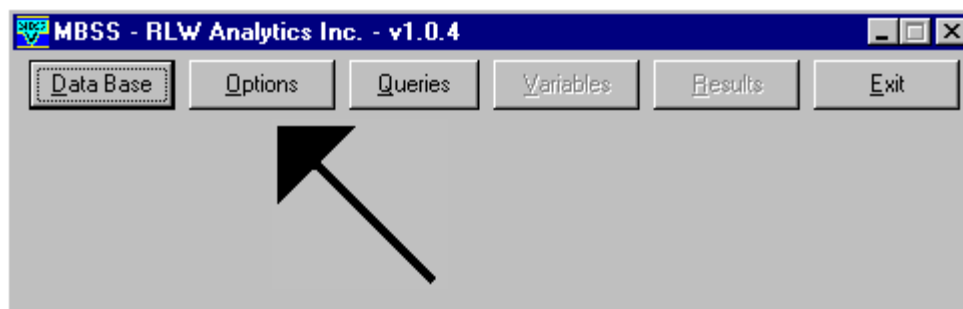
You may want to resize the window in order to see the complete filename of the analysis queries. The information you wish to analyze is found in the Analysis Query, the filename of the analysis queries indicate the category query you will need to execute the analysis and is an abbreviated description of the data found in that file. For example, if you wish to analyze the average water heater energy factor, select the Water Heater En Factor Avg from the analysis Query selection box. This file requires the selection of the Categories Query named categories-Water Heater. **For the appliance database, the suffix of the Analysis Query must match the prefix of the Categories query.**

For the analysis queries ending in **-SBA**, (found in the lighting database) a corresponding separate basis query must be selected under the Options button. The corresponding separate basis query will have the same name as the analysis query with a **SB-** prefix instead of a **-SBA** suffix.

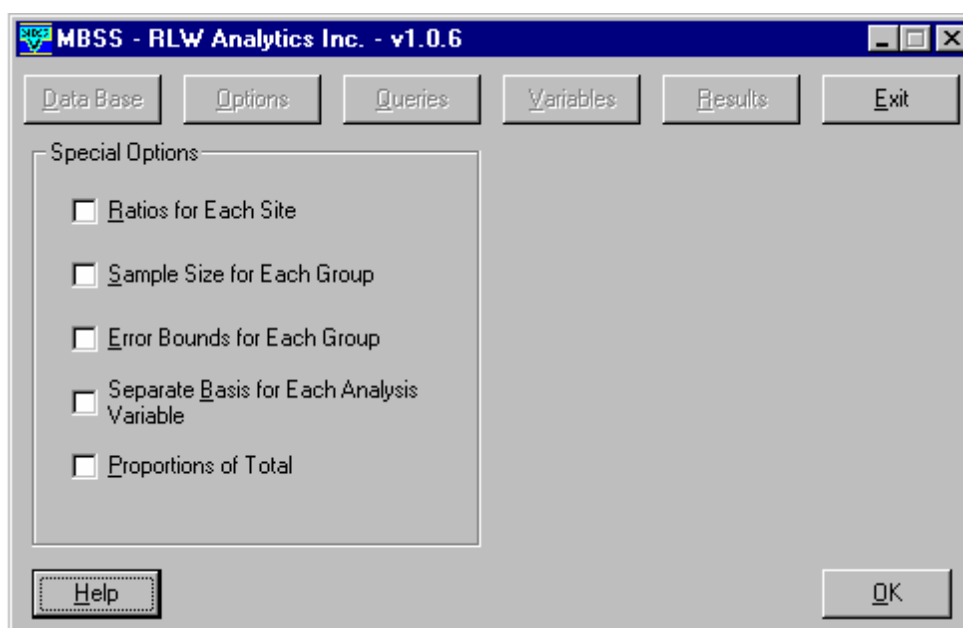
All of the analysis queries in the lighting database with a **-SBA** suffix have separate bases for each variable; KITCHEN-MOST OFTEN -SBA, KITCHEN SWITCHES-SBA and LIGHTING OVERVIEW-SBA. To analyze the information within these queries choose the categories query associated with the analysis query as usual. Then choose the Options from the main screen and the Separate Basis Query from the Special Options menu, the Separate Basis Query has the same root file name as the analysis query with a **SB-** prefix instead of a **-SBA** suffix; Namely SB-KITCHEN-MOST OFTEN, SB-KITCHEN SWITCHES and SB-LIGHTING OVERVIEW. Choose the associated separate basis query and click OK.

Note: When using the separate basis option make certain that both queries are sorted in the exact same way, e.g. by Site ID. If they are not sorted exactly the same, no results will be realized.

Options



If desired, click on the Options button to select special options. The following special options are available:



Ratios for each site – This option calculates ratios for each individual sample site and writes the ratios out to an Access table with the name “Sites_...” where ... is the Analysis Query name. This is useful for reviewing the characteristics of each sample site. If the Ratio for Each Site option is selected, no other table will be written, i.e. sample size and error bound will not be available and there will be no “results” table.

Sample size for each group – This option calculates and writes out the number of sites used to calculate the results for each group of sites. The results are written to an Access table with the name “SamSizes_...” where ... is the Analysis Query name. If a site has a zero basis for a particular characteristic it is not counted. This table will be generated simultaneously with the ‘Results_...’ table

Error bounds for each group – calculate and write out the error bounds for each characteristic in each group. The 90% level of confidence is assumed. The results are written to an Access table with the name “ErrBnds_...” where ... is the Analysis Query name. This table will be generated simultaneously with the ‘Results_...’ table

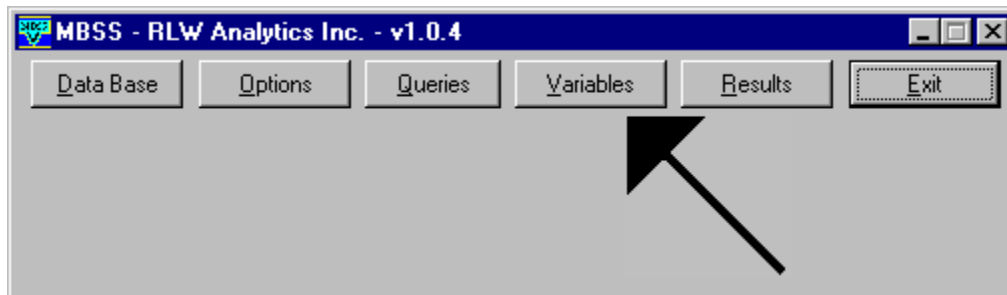
Separate basis for each analysis variable – For certain analyses, a separate basis for each variable is required. In order to accommodate these circumstances, separate bases queries have been created. All of these separate bases queries have been labeled with the prefix sb-. Once this special option has been selected, a selection box will appear with the list of all the queries contained in the database, select the desired separate bases query from this list. Only choose from those queries with the sb- prefix. Once you have selected a separate bases query, you must select a Categories Query and an Analysis Query associated with that Separate Bases Query.

Proportions of Totals – calculate and write out the total of the characteristic in each group as a fraction of the total of the characteristic across all groups. The results are written to an Access table with the name “Proportions_...” where ... is the analysis name. You can also

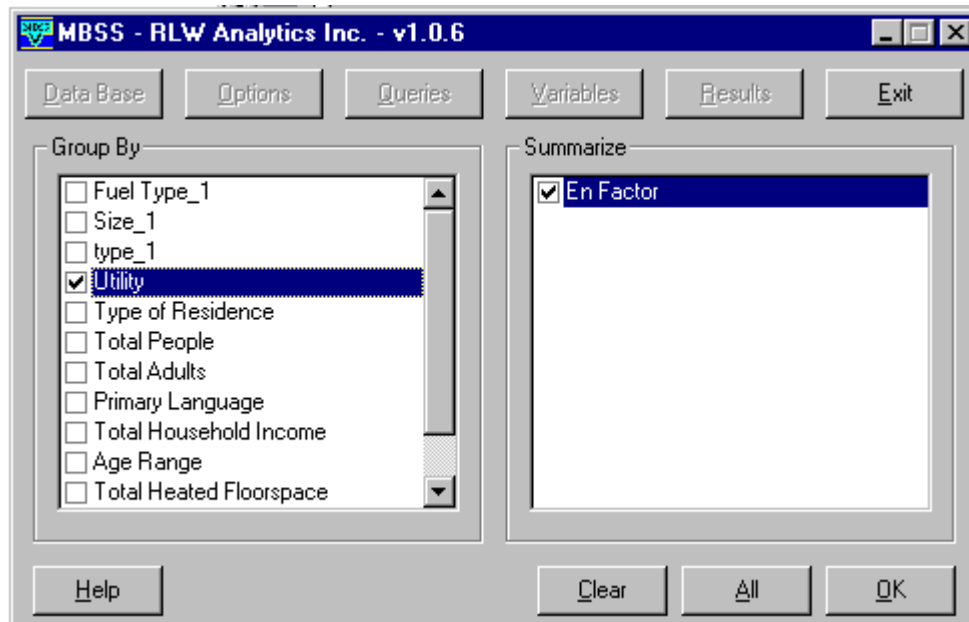
request error bounds for each proportion and sample sizes. The sample size is the total number of sites across all groups, excluding a site if (a) it has zero case weight, or (b) the value of the characteristic is equal to zero.

Variables

Click on the Variable button to select the variables for grouping the sites and the variables to be summarized.



Selecting the Group By variables: If you are using the standard Categories--gen query, the Group By list will contain the following variables: utility, type of residence, total people at residence, total adults at residence, primary language, total household income, age range of residence and whether the building is rented or owned.. You can select or clear any of the variables by clicking the corresponding box. For example, if you select both residence type and utility, results will be developed for all possible combinations of residence type and utility. If no Group By variables are selected, the results will describe all residences taken together. In the example below the residences will be grouped by utility.

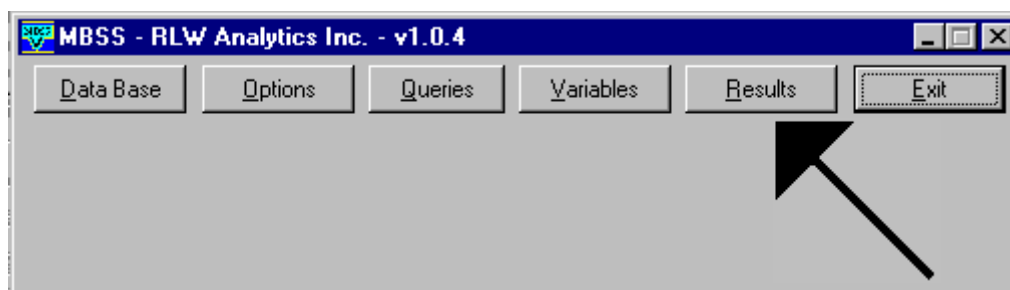


Selecting the Summarize variables: The list will display all of the variables contained in your analysis query except the Site ID and the bases. Each of the variables will be selected since you will usually want to summarize all of these variables.

If the list is very long (e.g., for lighting analyses), you may want to click on the Clear button to select none of the Summarize variables, and then manually select the specific variables you want to analyze. Click on the All button to select all of the Summarize variables. Click OK when you are ready to proceed. In the example above there is only a single variable to be summarized, there must be at least one variable checked for MBSS to run.

Results

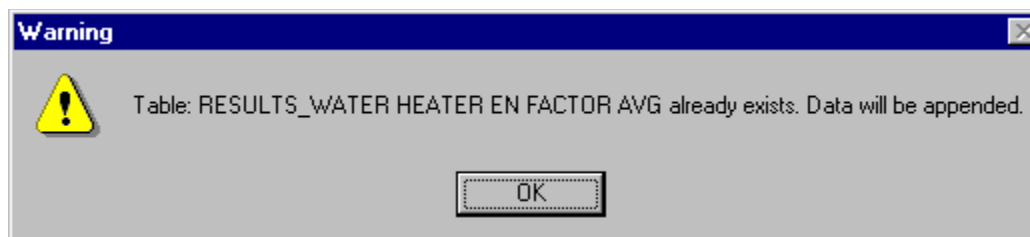
Click on the Results button to execute the analysis.



The screen will show the default name for the results table (the same name as the analysis query) and the default name for the first field (ID).

The actual table will be called "Results_..." where ... is the name that is shown in Table Name box, in the case shown above the table will be called Results_Water heater En factor Avg. The results table is added to the Access database. The ID field will have the value 1 for the first group, 2 for the second group, etc.

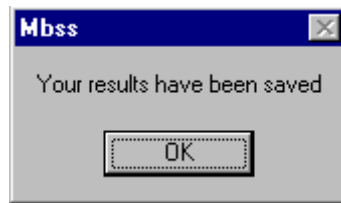
If the results table already exists in the Access database, this means that a previous run has been made using the same analysis query. A warning will appear as shown below:



Click OK and the new results will be appended to the bottom of the preexisting table, the previous results will be overwritten. The ID will be extended automatically. If you are appending to ratio, sample size, error bound or special basis, a warning will appear for each table you are appending to. You will not be able to append to any table that is currently open in Access.

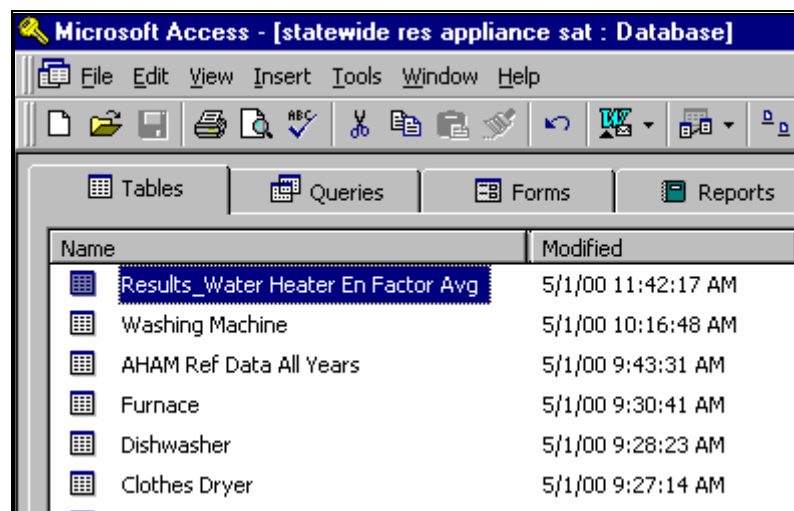
As MBSS is processing your analysis, a message box will be displayed with the SQL (standard query language) for your analysis. This can usually be ignored. If a separate basis for each variable is being used, the identical message box will be displayed a second time.

When the analysis is complete, a message box will be displayed indicating that your results have been saved.

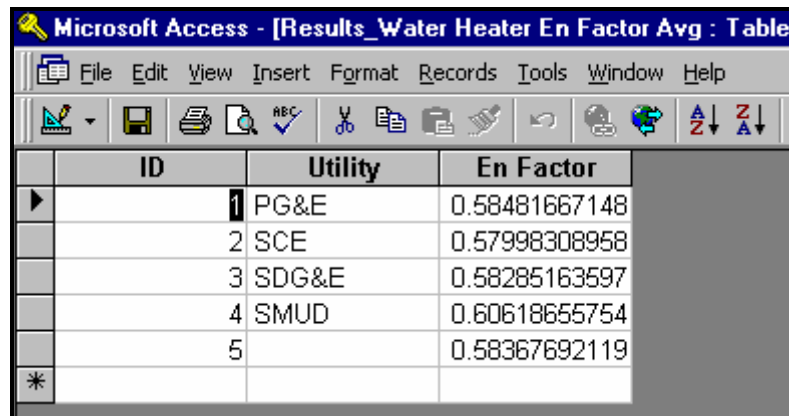


After the results have been written, you must use Access itself to review the results and to prepare reports.

Open the Access database, if not already open, and select the 'Tables' list, the results table you have just created should be there. If the Access database was open while MBSS was running, you may need to click on the queries tab and quickly return to the 'Tables' list before the new tables appear on the list.



After obtaining your results, you can change the options, queries, or variables and repeat the analysis. For example, suppose you have selected utility as the Group By variables in your first analysis. You may want to continue the analysis by selecting no group by variables. This will summarize your analysis variables for all residences. This will summarize your analysis variables across all residence types and all utilities. A message box will be displayed indicating that your new results will be appended to your existing results table unless you have typed in a new table name.



ID	Utility	En Factor
1	PG&E	0.58481667148
2	SCE	0.57998308958
3	SDG&E	0.58285163597
4	SMUD	0.60618655754
5		0.58367692119
*		

Here is an example of a results table, the row 5 is all of the utilities taken together.

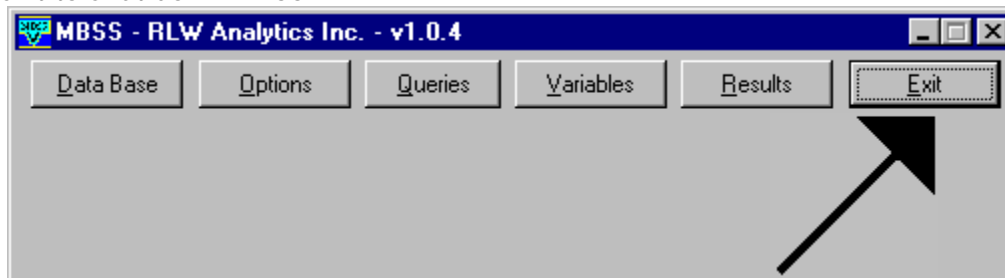
Note: You must click on the Results button each time you select different options, queries, or variables.

Note: You can open a results table in Access while MBSS is running. However, if you do additional MBSS analysis, you must re-open the database in Access to see the new MBSS results.

Hint: First select all of the Group By variables that you intend to use, and then drop variables from the analysis. This will improve the organization of your results table.

Exit

Click on exit to shut down MBSS.



Using Access to Create New Queries

You can obtain a wealth of information from the queries that are provided with the database. However, you can also use Access to create additional queries. But if you create a new query you must make sure it follows the following format.

Note: You can not open an Access Table directly in MBSS. If your data is in a table, design an Access query based on your table.

Note: The name of each of your variables (fields) should start with a letter. Do not use numbers alone as field names.

Creating a new Categories Query

The Categories query contains the categorical variables that can be used to form groups of sites. For example, if you want to group the sites by size you can create a new Categories query with a Size categorical variable.

Note: Each categorical variable should take a limited number of distinct values. For example, you should use several square footage intervals rather than square footage itself.

Format of the Categories Query

The following format is required. Any deviation will cause an error.

Field 1: Site ID (required)

Field 2: Case weight (required)

Fields 3 to j: Any desired categorical variables

Creating a new Analysis Query

The Analysis query is used to specify the variables to be analyzed. Usually the Analysis query also includes the basis to be used in the analysis of each of the variables. In some cases, however, each of the analysis variables requires a separate basis. In this case the bases are provided in a separate query.

Format of the Analysis Query

The following format is required. Any deviation will cause an error.

Field 1: Site ID (required)

Field 2: Case weight (required)

Fields 3 to j: Exactly the same categorical variables as the Categories query

Field j+1: Site ID (required)

Field j+2: Basis (required unless a Special Basis is used; if a Special Basis is used this field must be omitted)

Added fields: All variables to be analyzed or summarized

Note: Fields 1 to k are the same as the Categories query. These are usually obtained by using Access to join the Categories query to a table containing the basis variable and the variables to be analyzed.

Note: Your Categories and Analysis queries must have the same number of records. This is usually achieved by joining the underlying tables or queries by Site ID.

Note: The basis and the variables to be summarized must be numeric. Empty fields are converted to zeros.

Note: If the basis is equal to 1.0 for all sites, then MBSS will give the average value of the analysis variable per site in the population. See the underlying principles for more information.

Creating a new Separate Basis Query

A separate basis query is used to summarize a set of related variables using a unique basis for each variable. For example, the efficiency of different types of equipment can be summarized using the connected load of each category as a separate basis.

Format of the Separate Basis Query

The following format is required. Any deviation will cause an error.

Field 1: Site ID (required)

Field 2: Case weight (required)

Fields 3 to j: Exactly the same categorical variables as the Categories query

Field j+1: Site ID (required)

Added fields: The basis for each analysis variable included in the Analysis query.

Note: The Special Basis query must have the same number of variables as the Analysis query. The name of each basis variable in the special basis query must be identical to the corresponding variable in the Analysis query. This includes case sensitivity

Note: Fields 1 to k are the same as the Categories query. These are usually obtained by using Access to join the Categories query to a table containing the basis variables.

Note: The basis variables to be summarized must be numeric. Empty fields are converted to zeros.

Note: Your Categories, Summarize, and Special Basis queries must have the same number of records. This is usually achieved by joining the underlying tables or queries by Site ID.

Combining Characteristics

Some of the existing queries may provide a higher level of detail than you want. For example, the lighting fixture query describes nine different types of lighting fixtures. For some purposes you may want to combine several of these types. To combine several types of fixture, simply create a new query from the existing query. Retain all of the categorical variables and the basis variable but construct a new analysis variable as the sum of the analysis variables in the original query corresponding to each of the types to be combined.

If a special basis is being used, a new special basis query should be constructed in the same way. The basis for the new combination should be the sum of the basis for each of the types to be combined.

Underlying Principles

Why is a special tool needed? Two issues must be considered in summarizing the characteristics of a set of sites. First, the summary must reflect the basis of each characteristic. Second, the summary must reflect appropriate sampling weights.

Example 1

As a first example, suppose you want to know the energy factor, EF, of water heaters in a given population. Note that for water heaters, EF is defined as the energy content in the hot water delivered divided the total energy use of the water heater.

Similarly, the EF of a set of water heater supplied hot water energy delivered to the residents divided by the total annual kWh energy use. This can be written as

$$EF = \frac{\sum_{k \in P} AED_k}{\sum_{k \in P} AEC_k}$$

Here AED_k is the annual energy content delivered from each water heater k and AEC_k is annual energy consumed by water heater k in the target population P . The denominator of this equation, annual energy consumption, will be called the *basis* of this EF characteristic.

The preceding equation can also be written as

$$EF = \frac{\sum_{k \in P} (EF_k \times AEC_k)}{\sum_{k \in P} AEC_k}$$

Here EF_k is the energy factor of each site k . This second equation shows that the average EF is a weighted average of the EF of each site, using annual energy consumption as the weight.

In practice, of course, we must work with a sample of sites rather than the full population. In this case, we define the case weight w_k of each sample site k to be the number of sites in the population that it is thought to represent. The case weight w_k is the key to unbiased extrapolation from the sample sites to the population sites. In theory, the case weight should be the reciprocal of the inclusion probability under the sample design. For example, if the sample design specifies that 10 sites are to be randomly selected for the sample from a stratum containing 1,000 sites, the inclusion probability in this stratum is 10 / 1,000 and the case weight is 100.

We can estimate the water heater population EF using the following equation:

$$EF = \frac{\sum_{k \in s} w_k AED_k}{\sum_{k \in s} w_k AEC_k}$$

Here s denotes the sample sites. This can also be written as

$$EF = \frac{\sum_{k \in P} w_k (EF_k \times AEC_k)}{\sum_{k \in P} w_k AEC_k}$$

Example 2

Consider a second example. Suppose we want to estimate the proportion of freezers in a particular age range. We define a variable L_k to be the indicator variable for the characteristic 'home has a freezer of known age.' Specifically $L_k = 1$ if home k has a freezer and the age of the freezer is known, = 0 otherwise. Similarly we define L_{hk} to be the indicator variable for the characteristic 'home has a freezer of known age and the size is in a particular age range h .' Then the population proportion p_h of freezers in the age range h is equal to

$$p_h = \frac{\sum_{k \in P} L_{hk}}{\sum_{k \in P} L_k}$$

If we are working with a sample, we can estimate the population proportion of freezers in the age range h by calculating the following for each hour h .

$$p_h = \frac{\sum_{k \in s} w_k L_{hk}}{\sum_{k \in s} w_k L_k}$$

This type of calculation can be carried out for any desired selection of sites. For example, we can calculate energy factors or proportions for various building types, climate zones, or utility service areas, i.e., for any group in the population that is identified by the selected categories variables. In this case s denotes the set of sites falling within the designated group.

General Form

The preceding examples have the same general form – that of a stratified ratio estimator.

For each site k , the characteristic of interest is often a ratio $R_k = y_k/x_k$, e.g., kWh per square foot, or kW in hour h divided by total connected kW. In general MBSS terminology, y_k is called the dependent variable and x_k is the explanatory variable. In the present application, we have called y_k the variable to be analyzed or summarized, and we have called x_k the basis variable. Then the population characteristic of interest is the ratio

$$R = \frac{\sum_{k \in P} y_k}{\sum_{k \in P} x_k}$$

The preceding equation can also be written

$$R = \frac{\sum_{k \in P} x_k R_k}{\sum_{k \in P} x_k}$$

In this form it is evident that R is a weighted average of the values of R_k for all sites in the target population.

Generally we do not have the values of both y_k and x_k for all sites in the population. But for each site in the sample, we do have a weight w_k that can be used to extrapolate the sample to the population. In this case we calculate an estimate of R that is denoted \hat{R} and calculated using the equation:

$$\hat{R} = \frac{\sum_{k \in s} w_k y_k}{\sum_{k \in s} w_k x_k}$$

The preceding equation can also be written

$$\hat{R} = \frac{\sum_{k \in s} w_k x_k R_k}{\sum_{k \in s} w_k x_k}$$

Error Bounds

MBSS can calculate the statistical error bound for any ratio estimate. The error bound can be used to calculate a confidence interval for the true characteristic in the population. For example suppose the EF has been found to be 0.60, with an error bound of 0.02. Then corresponding confidence interval is 0.60 ± 0.02 kWh / square foot, or 0.58 to 0.62. All error bounds are at the 90% level of confidence.

Following MBSS principles, the error bound eb is calculated using the following equations:

$$e_k = y_k - \hat{R} x_k$$

$$V(\hat{R}) = \frac{\sum_{k \in s} w_k (w_k - 1) e_k^2}{\left(\sum_{k \in s} w_k x_k \right)^2}$$

$$eb = 1.645 \sqrt{V(\hat{R})}$$

With ratio estimation, the error bound is affected by several factors including the sample size and the weights. But the most important factor is generally the strength of the association between the two variables y_k and x_k for all sample sites. If y_k is consistently close to \hat{R} times x_k for all sample sites, then there is a strong association between the two variables. In this case, the error bound will be small. In effect, if R_k is fairly stable from site to site, then we can estimate the value of R in the population with good statistical precision.

Averages

MBSS can also estimate the average value of a variable in a population. We define N to be the total number of sites in the population. Then the population average of y , denoted μ , is defined to be

$$\mu = \frac{1}{N} \sum_{k=1}^N y_k$$

The sample estimate of the population mean μ is denoted \bar{y} . With a weighted sample, the sample mean is calculated using the equation

$$\bar{y} = \frac{\sum_{k \in s} w_k y_k}{\sum_{k \in s} w_k}$$

The preceding equation can be obtained from the standard ratio equation by defining $x_k = 1$. In words, the average of y is obtained by using y as the variable to be summarized and by choosing 1 as the basis.

Note: The error bound calculated by MBSS may be misleading in this situation since it does not reflect stratification.

General form of the Queries

This section describes the format of the queries using the notation developed in the preceding sections.

Categories Query

Field 1 Site ID, k
 Field 2 Case weight, w_k
 Field 3 to j Any desired categorical variables used to group the sites

Analysis Query

Field 1 Site ID, k
 Field 2 Case weight, w_k
 Field 3 to j The same categorical variables as in the categories query
 Field $j+1$ Site ID, k
 Field $j+2$ Basis, x_k (omitted if a special basis is used)

Added Fields One or more y_k

Special Basis Query

Field 1 Site ID, k

Field 2	Case weight, w_k
Field 3 to j	The same categorical variables as in the categories query
Field j+1	Site ID, k
Added Fields	Basis, x_k for each y_k in the analysis query (with the <u>same name</u>)

Additional Options

MBSS provides special options for calculating:

- The sample size option calculates the number of sample sites for each result, excluding cases for which $w_k x_k = 0$ and $w_k y_k = 0$.
- The site specific ratios option calculates $R_k = y_k / x_k$ for each site k .
- The proportions of total option calculates

$$\hat{p} = \frac{\sum_{k \in g} w_k y_k}{\sum_{k \in s} w_k y_k}$$

Here g is any specific group determined by the selected category variables, and s is the full sample across all groups.

Onsite Survey Instrument

A software application was developed by RLW for mini PC (HP IPAQ) computers. The application contained the questions shown in the following survey.

Customer: _____

Customer ID # _____

Address _____

City: _____

MO# _____

Phone: _____

Inspector _____

Date _____

Time _____

Occupant Interview - Introduction

Hello, my name is _____ with RLW Analytics, working on behalf of (NW Energy Efficiency Alliance or UTILITY NAME).

I'm here to meet with _____. **(Show Identification and business card.)**

[Customer should be expecting inspector].

On-Site Interview

During my visit I'll be asking a few questions about your home's primary lighting fixtures and major appliances. Then I'll go on to inspect your heating and cooling equipment, washer, dryer, dishwasher, refrigerator, freezer, water heating equipment, and the insulation levels in your home. Do you have any questions regarding my visit?

General Information

1. Type of Residence?
 - Single Family, Unattached, One story
 - Single Family, Unattached, Two story
 - Single Family, Unattached, Three or more stories
 - Townhouse or Rowhouse
 - Duplex, Triplex, or Quadplex
 - Apartment/Condo with more than 4 units (1 or 2 stories)
 - Apartment/Condo with more than 4 units (3 or more stories)
 - Mobile Home, Single Wide
 - Mobile Home, Double Wide
 - Mobile Home, triple Wide
 - Modular/prefabricated
 - Other _____

2. What month/year did you move into home? _____

3. How many people live in this household in the following age ranges?
 - Under 1 year _____
 - 2 to 5 years _____
 - 6 to 18 years _____
 - 19 to 29 years _____
 - 30 to 49 years _____
 - 50 to 64 years _____
 - 65 or more years _____

4. Number of people working outside the home _____

5. Do you operate a business out of the home?
 - Yes
 - No

6. Do you rent or own this home?
 - Own/Buying
 - Rent
 - Occupied without payment of rent
 - Who pays the electric bill? Occupant Landlord
 - Who pays the gas bill? Occupant Landlord

7. What is the total annual income for the home? _____ (to the nearest \$5,000)
 - D/K
 - Refused

8. What is the total conditioned floor area of the home?

9. Do you have a garage?
 - No
 - Single
 - Double
 - Triple

10. Is the garage heated?
 - No heat
 - Electric Heat
 - Gas Heat
 - Propane

- Wood stove
- Other

11. Frequency of use?

- Never
- Very Little
- Sometimes
- Often

12. Percent of Home not heated: _____

Other major end uses:

- | | | | |
|---------------------------------|-------|-----|-----------------------|
| 13. Attic Ventilation Fan | yes | no | |
| 14. Well Pump | yes | no | |
| 15. Driveway snow melting coils | yes | no | |
| 16. Crank case heater | | yes | no |
| 17. Solar PV | yes | no | _____ #watts |
| 18. Welding equipment | yes | no | |
| 19. Shop equipment | yes | no | |
| 20. Air Cleaner | yes | no | _____ How often used? |
| 21. Other (describe) | _____ | | |

Plug loads:

- | | |
|---|-------|
| 22. # of TVs | _____ |
| 23. # of VCR/DVDs/DVR | _____ |
| 24. # of camera/camcorder chargers | _____ |
| 25. # of gaming consoles | _____ |
| 26. # of computers/workstations/laptops | _____ |
| 27. # of printers | _____ |
| 28. # faxes | _____ |
| 29. # of portable MP3/CD players | _____ |
| 30. # of PDA's | _____ |
| 31. # of satellite/cable boxes | _____ |
| 32. # of cell phone chargers | _____ |
| 33. # of cordless phones | _____ |
| 34. # of answering machines | _____ |
| 35. # of stereos | _____ |

Thermostat Information

36. Thermostat type:
- Digital
 - Hybrid

- Mechanical
- Not Observed
- Other

37. Heating: Daytime Temp:_____/OFF/ No Cooling Nighttime Temp_____
/OFF(not used)
Cooling: Daytime Temp:_____/OFF/No Cooling Nighttime Temp_____
/OFF(not used)

38. Amount of Override: All the time / Often / Sometimes / Never

Primary Heating Information

39. Primary heating system fuel type:

- Gas
- Fuel Oil
- Electricity
- Wood: cords per year_____
- Kerosene
- Solar
- Propane
- Pellets

40. Primary heating system type:

- Wall
- Heat pump w/ electric supplement
- Heat pump w/o electric supplement
- Forced Air Furnace
- Hydronic System
- Floor
- Ceiling Cable
- Fireplace
- Window Unit Resistance
- Woodstove
- Baseboards
- Pellet Stove

41. Heating System # 1 Specs:

- Manufacturer
- Model #:
- Manufacture Date:
- Estimated Age:
- Input Capacity (kW, kBtu):

- Output Capacity (kW, kBtu):
- Efficiency:

Secondary Heating System

42. Is there a secondary heating system in your home? yes no
(if no, skip to next section)

43. Secondary heating system fuel type:

- Gas
- Fuel Oil
- Electricity
- Wood: cords per year _____
- Kerosene
- Solar
- Propane
- Pellets

44. Secondary heating system type:

- Baseboards
- Wall
- Heat pump w/ electric supplement
- Heat pump w/o electric supplement
- Forced Air Furnace
- Portable
- Hydronic System
- Floor
- Ceiling Cable
- Fireplace
- Window Unit Resistance
- Woodstove
- Pellet Stove

45. Heating System # 2 Specs:

- Manufacturer
- Model #:
- Manufacture Date:
- Estimated Age:
- Input Capacity (kW, kBtu):
- Output Capacity (kW, kBtu):
- Efficiency:

Primary Cooling System

46. Do you have an air conditioning/cooling system for your home? [Do not include fans]?

Yes No [Go to next section]

47. AC system type:

- Split System AC
- Packaged System AC
- Evaporative System
- Portable- Stand Alone
- Heat Pump
- PTAC
- PTHP

48. Cooling System # 1 Specs:

- Manufacturer
- Model #:
- Manufacture Date:
- Estimated Age:
- Capacity (kW, kBtu):
- Efficiency:

Secondary Cooling System

49. Do you have a second air conditioning/cooling system for your home? [Do not include fans]?

Yes No [Go to next section]

50. Secondary AC system type:

- Split System AC
- Packaged System AC
- Evaporative System
- Portable- Stand Alone
- Heat Pump
- PTAC
- PTHP

51. Cooling System # 2 Specs:

- Manufacturer
- Model #:
- Manufacture Date:
- Estimated Age:
- Capacity (kW, kBtu):

- Efficiency:

Clothes Washer

52. Do you have a Clothes Washer?

- Yes
- No

53. Type of washer: Standard Horizontal axis Stacked-Horizontal Stacked-Standard

54. Washing Machine Specs:

- Manufacturer:
- Model #:
- Manufacture Date:
- Estimated Age:
- Energy Factor:

Get information on other washer, if applicable

Clothes Dryer

55. Use of dryer:

- No dryer present
- Used for All Loads
- Used for Most Loads
- Infrequent Use
- Unknown

56. Fuel type: Electric Gas Propane Other

57. Dryer Specs:

- Manufacturer:
- Model #:
- Manufacture Date:
- Estimated Age:

58. Moisture Sensor?

- Yes
- No
- DK

Refrigerators:

59. Type of Primary Refrigerator:

- Standard
- Side by Side
- Single Door
- Bottom Freezer
- Compact

60. Primary Refrigerator Options:

- None
- Ice maker
- Through the door service

61. Refrigerator Volume:

- VERY SMALL (<=10 CUBIC FEET)
- SMALL (11-14 CUBIC FEET)
- MEDIUM (15-18 CUBIC FEET)
- LARGE (19-22 CUBIC FEET)
- VERY LARGE (>22 CUBIC FEET)

62. Primary Refrigerator Specs:

- Manufacturer:
- Model #:
- Manufacture Date:
- Estimated Age:

**SAME INFO FOR SECONDARY AND THIRD REFRIGERATOR (IF APPLICABLE),
ALSO INCLUDE THE FOLLOWING QUESTIONS FOR THESE UNITS.**

63. What percentage of the year is the refrigerator plugged in?
_____ %

Other Kitchen Appliances:

64. Range Fuel Type: _____

65. Oven Fuel Type: _____

66. Dishwasher Specs:

- Manufacturer:
- Model #:
- Manufacture Date:
- Estimated Age:

Water Heater

67. Water Heater Type?

- GAS STORAGE
- PROPANE STORAGE
- ELECTRIC STORAGE
- GAS INSTANTANEOUS
- ELECTRIC INSTANTANEOUS
- HEAT PUMP
- Solar
- Solar w/ Electric Storage
- Solar w/ Gas Storage
- Solar w/ Propane

68. Hot Water Heater Specifications

- Manufacturer:
- Model #:
- Tank Size:
- Input (kW or kBtu):
- Energy Factor:
- External Tank Wrap (Y/N):
- Internal R-value:
- Manufacture Date:
- Estimated Age:

Spa/Pool

69. Do you have a hot tub?

- Yes
- No
- Yes, but not currently used

70. What fuel does your hot tub's hot water heater use?

- Electric
- Gas
- Propane
- Solar / Electric
- Solar / Gas
- Solar / Propane

71. Do you have a pool?

- Yes
- No
- Yes, but not currently used

72. What fuel does your pool's heater use?

- Electric
- Gas
- Propane
- Solar Only
- Solar / Electric
- Solar / Gas
- Solar / Propane

Basement

73. Basement Type:

- None
- Finished/Conditioned
- Finished/Unconditioned
- Unfinished/Conditioned
- Unfinished/Unconditioned

74. Basement floor area: _____ Perimeter (feet) _____

Slab Below Grade U-Value

75. Basement R-value

	Type #	Area
Wall 1		
Wall 2		
Wall 3		

1. Below Grade R-0	4. Uninsulated Slab Below Grade	7. R-13	.07	10. R-21	.04
2. Below Grade R-11	5. R-0	8. R-15	.06		
3. Below Grade R-19	6. R-11	9. R-19	.05		

76. Basement Perimeter Venting:

- Open
- Closed
- None

Basement Notes:

Floors

77. Floor **UA**

	Type #	Area
Floor 1		

Floor 2		
Floor 3		

1. Crawl Uninsulated	3. Crawl R-13	5. Crawl R-19	7. Crawl R-30
2. Uninsulated Slab on Grade	4. Uninsulated Slab Below Grade	6. Insulated Slab on Grade	8. Over Open (airspace of 4ft. or greater)

78. Crawlspace Perimeter Venting

- Open
- Closed
- None

Floors Notes:

Walls

79. Wall (no orientation)

	Type #	Area
Wall 1		
Wall 2		
Wall 3		

1. Below Grade R-0	4. Uninsulated Slab Below Grade	7. R-13	10. R-21
2. Below Grade R-11	5. R-0	8. R-15	11. R-25
3. Below Grade R-19	6. R-11	9. R-19	

80. Wall construction type:

- 2 x 4
- 2 x 6
- Masonry
- Not observable

Walls Notes:

Attic/Ceiling

81. Attic Insulation: _____ Square footage _____
 Vaulted Insulation: _____ Square footage _____

1. R-0	2. R-5	3. R-11	4. R-13	5. R-15	6. R-19
7. R-30	8. R-38	9. R-44	10. R-48	11. R-50	

82. Radiant Barrier?

- Yes
- No

Attic/Ceiling Notes:

Windows

83. Windows

Orientation	Square Footage	Window Type
North		
East		
South		
West		

1. Single Metal	3. Double Metal	5. Single NonMetal
2. Double NonMetal	4. Double Metal Low-E	6. Double NonMetal Low-E

Windows Notes:

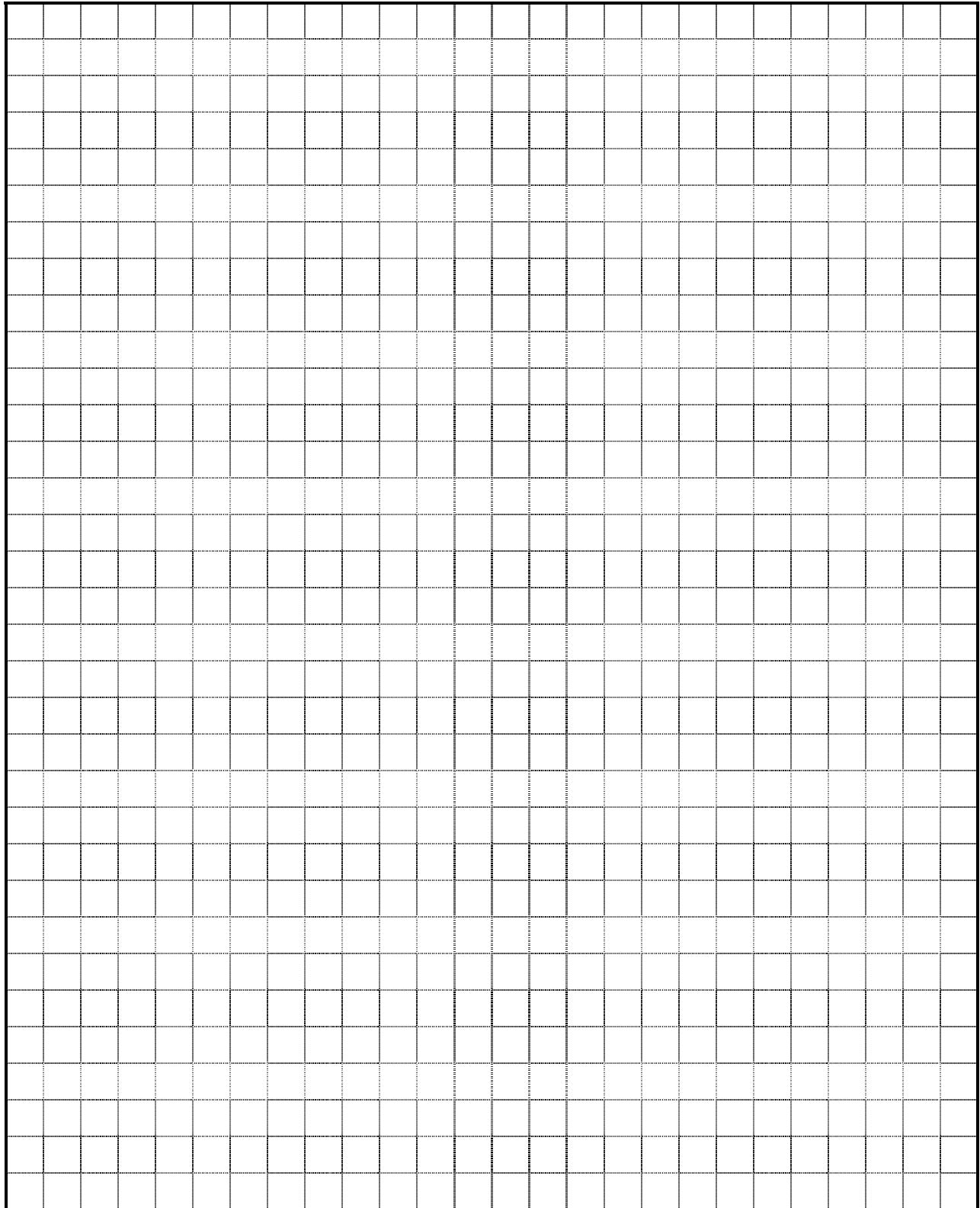
Lighting and Ceiling Fans (census of sockets in home by room)

In each of the following rooms, record the number of fixtures by type and the number of lamps by type:

Room Types	Fixture Types	Lamp Types	Lamp Descriptions
Basement	Ceiling fixtures	CF-I-A	Compact fluorescent type A-style-lamp, integrated ballast (screw base)
Bathroom - 1	Ceiling Fan	CF-I-CAP	Compact fluorescent type Capsule, integrated ballast (screw base)
Bathroom - 2	Floor Lamp	CF-I-CIRC	Compact fluorescent type Circline integrated ballast screw base)
Bathroom - 3	Other	CF-I-DEC	Compact fluorescent type decorative, integrated ballast (screw base)
Bathroom - Master	Architecturally Integrated	CF-I-FLOOD	Compact fluorescent type PAR/FLOOD/REF, integrated ballast (screw base)
Bedroom - 1	Garage Door Opener	CF-I-GLO	Compact fluorescent type globe integrated ballast (screw base)
Bedroom - 2	Wall mount	CF-I-SPRN	Compact fluorescent type spring lamp, integrated ballast (screw base)
Bedroom - 3	Recessed lighting-Other	CF-I-Tube	Compact fluorescent type tube integrated ballast (screw base)
Bedroom - 4	Recessed can	CF-I-UNK	Compact fluorescent type unknown, integrated ballast (screw base)
Bedroom - Master	Torchiere	CF-Mini	Any CFL with mini screw base
Breakfast Nook	Chandelier / Hanging	CF-PIN-Base	Compact fluorescent type all, non-integrated ballast (pin base)
Closet	Table lamps	F-12	T-12 Fluorescent
Dining Rm	Track lighting	F-4	T-4 Fluorescent
Family Room	Under Counter	F-5	T-5 Fluorescent
Garage		F-8	T-8 Fluorescent
Hall		F-CIR	T-12 or T-8 Circular
Kitchen	Control Types	F-OTH	Other Tube Fluorescent not listed above
Laundry Rm	Switch	F-TUBE-UNK	Unknown fluorescent tube lamp
Living Rm	Dimmer	HAL-MR	MR-16 pin based halogen
Office	Motion	HAL-PAR	Halogen Parabolic Reflector
Other	Photocell	HAL-QTztub	Halogen quartz tube
Porch	Photo/motion	HAL-UNK	Unknown halogen type lamp
Rec Rm	Timer	HAL-OTH	Other Halogen lamp not listed above
		I-DEC	Decorative screw based incandescent
Wattage		I-FLOOD	Flood/PAR screw based incandescent
888 - three way		I-GLO	Globe style screw based incandescent
999 - unknown		I-Mini	Any incandescent with mini screw base
		I-OTH	Other screw based incandescent
		I-STD	Standard screw based incandescent
		I-UNK	Unknown type screw based incandescent
		HEAT LAMP	Relatively high wattage incandescent lamp commonly found in bathrooms

Sketch the House Floor Plan (Be sure to include dimensions and north arrow)

Level _____ Total floor sqft _____



Lighting Fixture and Technology Definitions

The following table provides descriptions of the fixture types that were differentiated during the on-site data collection.

Fixture Type	Fixture Description
Architecturally Integrated	Fixtures incorporated into the structure of the residence such as valence and cove style lighting fixtures that may incorporate indirect lighting. Also includes directional fixtures for display of art and fixtures that are integrated into cabinetry.
Ceiling Fan	Any ceiling mounted fixture that incorporates an operable fan in the design of the fixture. This excludes bathroom fans that include a lamp in its design.
Chandelier / Hanging	Typical decorative chandeliers with one or more lamps. Also includes any fixture that is suspended from the ceiling by a flexible or rigid medium such as a piece of chain.
Ceiling Mount	Fixtures that are mounted directly onto the ceiling surface.
Floor Lamp	Any fixture, excluding torchieres, which has its base directly on the floor.
Garage Door Opener	Garage door opener that includes a lamp.
Other	Any fixture not matching one of the other category descriptions.
Recessed Can	Cylindrical cans that are set into a ceiling with the bottom edge of the can flush with the ceiling surface (recessed). These fixtures are designed to direct the light downwards.
Recessed Lighting - Other	Any other shape of fixture besides a can, square for example, that is set into the ceiling and has the bottom of the fixture flush with the ceiling surface.
Table Lamp	Fixtures that are placed on raised surfaces. Could be an end table lamp or a desk light for example.
Torchierre	Floor lamps usually five to six feet in height that direct the light source upwards.
Track Lighting	Multiple lamps and casings mounted to a linear piece of material, which itself is attached to either a ceiling or wall surface. The individual lamps can usually be adjusted to direct the light in a specific direction.
Under Counter	This fixture is typically mounted underneath cabinets so they illuminate the surface under the cabinet it's mounted to.
Wall Mount	Fixtures that are mounted directly to a vertical wall and are not utilized to illuminate art.

The following table provides descriptions of the lamp types that were differentiated during the on-site data collection.

Lamp Type	Description
Compact Fluorescent Overview	Discharge lamps, with necessary ballast, available in multiple sizes that are used as energy efficient options for fixtures that typically utilize incandescent lamps. The different lamp wattage, shape, and ballast/lamp combinations of compact fluorescent lamps (CFL's) are briefly discussed next.
Compact Fluorescent Unknown	A CFL that doesn't fit into one of the other CFL categories or for a CFL whose specific type was unobservable because a fixture cover obstructed it, for example, during the on-site.
Compact Fluorescent Globe	An integral CFL that has the illuminating fluorescent tubes covered with a globe shaped piece of glass. The lamp tubes are not visible to the eye because of this cover.
Compact Fluorescent Integral	Integral describes the lamp/ballast relationship of the CFL. This type of CFL is made up of one piece incorporating the lamp and ballast. If either the lamp or ballast component breaks, the whole unit has to be replaced.
Compact Fluorescent Modular	Modular describes the lamp/ballast relationship of the CFL. The lamp and ballast are separate and either can be replaced without replacing the other when utilizing a CFL modular.
Compact Fluorescent Reflector	This lamp type is a CFL, regardless if it is integral or modular, which incorporates a parabolic aluminized reflective surface to reflect light onto the illuminated surface.
Compact Fluorescent Square	This CFL has its tubes in the shape of a square, which results in a thin lamp profile useful for torchierre and some recessed ceiling fixture applications.
Fluorescent Overview	Refers to type of lamps that utilize a glass tube, gases, and electric currents to produce light. Types of fluorescent lamps that are differentiated for this project are discussed.
Fluorescent T12	Multiple length linear fluorescent tubes with a diameter of one and a half inches. Differentiation between standard and low watt T12 lamps wasn't made on site.
Fluorescent T8	Multiple length linear fluorescent tubes with a diameter of one inch.
Fluorescent Circline	T12 or T8 fluorescent tubes that are circular in shape.
Fluorescent Other	Some possible examples of an 'other' fluorescent lamp are the T5 lamps that are often found in under counter

	fixtures and U-tube fluorescent lamps.
Fluorescent Tube Unknown	A type of fluorescent lamp that the surveyor was unable to identify. This type would have been selected if the surveyor were unable to verify lamp because the fixture was inaccessible, the customer didn't want surveyor to open fixture, or the surveyor couldn't identify the type but knew that it was a fluorescent lamp.
Halogen Overview	Halogen lamps utilize incandescent lamp technology with the exception that a halogen gas is added. They have different shapes than incandescent lamps and are usually more compact.
Halogen Other	Any identified tubular or capsulated halogen lamp not in the categories listed. MR16 lamps are an example of a halogen lamp listed as other.
Halogen Parabolic Reflector	A screw in halogen lamp enclosed in a capsule with a reflective surface. A piece of textured glass covers the light source, thus making it easy to distinguish between a parabolic reflector halogen and a reflective incandescent.
Halogen Tubular	Single ended and double ended halogen lamps that utilize a tubular shape. The lamps are not encapsulated like the parabolic reflector type.
Halogen Unknown	Any type of halogen lamp that the surveyor was unable to identify.
Incandescent Overview	Incandescent lamps utilize the passing of electric current through a filament causing the filament to emit light. All incandescent lamps screw in the light socket.
Incandescent Standard	Typical A-lamp incandescent lamps with an elliptical shape that becomes wider towards the top of the lamp.
Incandescent Decorative	Incandescent lamps in the shape of candles, for example, that are used in chandeliers and other fixtures for decorative purposes.
Incandescent Globe	Types of incandescent lamps that have a round shape, as opposed to the elliptic shape of standard A-type incandescent lamps.
Incandescent Other	Any type of incandescent lamp that the surveyor found and was unable to assign it to a known category.
Incandescent Reflector	A reflective material is applied to the inside of the lamp to reflect more light onto the illuminating surface. The top of the fixture has a larger diameter than standard A-type lamps.
Incandescent Unknown	Any type of incandescent lamp that the surveyor was unable to identify.

Single Family Lighting Data Tables and Queries

Lighting Table Definitions

All - Fixtures Table

The All - Fixtures Table contains the number of fixture types per room type in each home.

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Room	Room type	
Number of Fixtures	Total fixtures in house	
Archit_Integrated	Number of architecturally integrated fixtures	
Ceiling Fan	Number of ceiling fan fixtures	
Ceiling Fixtures	Number of ceiling fixtures	
Chandelier Hanging	Number of hanging chandelier	
Floor Lamp	Number of floor lamps	
Garage Door Opener	Number of garage door openers	
Other	Number of other fixtures	
Recessed can	Number of recessed can fixtures	
Recessed lighting Other	Number of recessed lighting other fixtures	
Table lamps	Number of table lamps	
Torchiere	Number of torchieres	
Track lighting	Number of track lighting fixtures	
Under Counter	Number of under counter fixtures	
Wall mount	Number of wall mount fixtures	

All - Lamps Table

The All - Lamps Table contains the number of lamp types per room type in each home.

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Room	Room type	
Total Lamps	Total number of lamps in the house	
CF-I-A	Number of A-type compact fluorescent lamps with an integrated ballast	
CF-I-CAP	Number of capsule compact fluorescent lamps with an integrated ballast	
CF-I-CIRC	Number of circline-type compact fluorescent lamps with an integrated ballast	
CF-I-DEC	Number of decorative-type compact fluorescent lamps with an integrated ballast	
CF-I-FLOOD	Number of flood-type compact fluorescent lamps with an integrated ballast	
CF-I-GLO	Number of globe-type compact fluorescent lamps with an integrated ballast	

CF-I-SPRN	Number of spring-type compact fluorescent lamps with an integrated ballast	
CF-I-TUBE	Number of tube-type compact fluorescent lamps with an integrated ballast	
CF-I-UNK	Number of unknown type compact fluorescent lamps with an integrated ballast	
CF-MINI	Number of miniature compact fluorescent lamps	
CF-PIN-BASE	Number of pin based compact fluorescent lamps with an integrated ballast	
F-12	Number of F-12 fluorescent lamps	
F-4	Number of F-4 fluorescent lamps	
F-5	Number of F-5 fluorescent lamps	
F-8	Number of F-8 fluorescent lamps	
F-CIR	Number of circline fluorescent lamps	
F-OTH	Number of other fluorescent lamps	
F-TUBE-UNK	Number of unknown fluorescent lamps	
HAL-MR	Number of halogen MR lamps	
HAL-OTH	Number of other halogen lamps	
HAL-PAR	Number of halogen PAR lamps	
HAL-QTZTUB	Number of halogen quartz tube lamps	
HAL-UNK	Number of unknown halogen lamps	
HEAT LAMP	Number of heat lamps	
I-DEC	Number of incandescent decorative lamps	
I-FLOOD	Number of incandescent flood lamps	
I-GLO	Number of incandescent globe lamps	
I-MINI	Number of incandescent mini lamps	
I-OTH	Number of other incandescent lamps	
I-STD	Number of incandescent standard A-type lamps	
I-UNK	Number of unknown incandescent lamps	

Control and Wattage ALL Table

The Control and Wattage ALL table contains the inventory of fixture type and quantity, lamp type, wattage, and quantity, and control type in each room of the home.

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Room	Room type	
FixType	Type of light fixture	
FixQTY	Number of each fixture	
LampType	Lamp technology installed in fixture	
LampQTY	Number of lamps per fixture	
LampWATTS	Wattage of lamps in fixture	
Total Lamp Qty	Number of similar lamps in similar fixtures	
LControl	Switch, timer, dimmer, motion, photo	

Fixture Number	Unique number identifier generated for fixture	
----------------	--	--

Fan Lamp Types Table

The Fan Lamp Types table provides the total number of ceiling fans as well as the number of ceiling fans in the home containing each lamp type.

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Number of Fans	Number of Ceiling Fans in the Home	
CF CFU	Number of Ceiling Fans Containing a Compact Fluorescent Unknown Lamp	
CF CI	Number of Ceiling Fans Containing a Compact Fluorescent Integral Lamp	
CF CO	Number of Ceiling Fans Containing a Compact Fluorescent Other Lamp	
CF DK	Number of Ceiling Fans Containing an Unknown Lamp	
CF FC	Number of Ceiling Fans Containing a Fluorescent Circline Lamp	
CF HO	Number of Ceiling Fans Containing a Halogen Other Lamp	
CF IA	Number of Ceiling Fans Containing a Standard Incandescent Lamp	
CF ID	Number of Ceiling Fans Containing an Incandescent Decorative Lamp	
CF IG	Number of Ceiling Fans Containing an Incandescent Globe Lamp	
CF IO	Number of Ceiling Fans Containing an Incandescent Other Lamp	
CF IR	Number of Ceiling Fans Containing an Incandescent Reflector Lamp	
CF IU	Number of Ceiling Fans Containing an Incandescent Unknown Lamp	

General Information Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Type of Residence	Single Family Home, Apartment, etc.	
Total People	Total Number of Residents at Site	
Total Adults	Total Number of Adults at Site	18 and Over
People		
Adults		
People Under 1 year	Total Number of People Under 1 Year at Site	
People 2 to 5 years	Total Number of People between 2 to 5	

	years at site	
People 6 to 18 years	Total Number of People between 6 to 18 years at site	
People 18 to 29 years	Total Number of People between 18 to 29 years at site	
People 30 to 49 years	Total Number of People between 30 to 49 years at site	
People 50 to 64 years	Total Number of People between 50 to 64 years at site	
People 65 or more years	Total Number of People over 65 years at site	
Income	Annual Household Income Range	Resident Supplied
Total Heated Sqft	Square Footage Range of Residence	
Age Range	Age Range of Residence	
Rent or Own	Ownership Status of Residence	
Who Pays Electric? (Occ or Landlord)	Responsibility for Electric Bill	
Who Pays Gas?	Responsibility for Gas Bill	
Total Heated Floorspace	Square Footage of Heated Floorspace of Residence	

Rooms – Fixtures Table

The Rooms - Fixtures table provides, for each room type including the whole house, the total number of fixtures as well as indicator variables indicating whether the site had a particular fixture type and lamp type combination.

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Room	Room Type	
Number of Fixtures	Total Number of Fixtures	
Archit_ Integrated	Count of Architecturally Integrated Fixtures	
Ceiling Fan	Count of Ceiling Fan Fixtures	
Ceiling fixtures	Count of Ceiling Mounted Fixtures	
Chandelier Hanging	Count of Chandelier/Hanging Fixtures	
Floor Lamp	Count of Floor Lamps	
Garage Door Opener	Count of garage door openers	
Other	Count of other fixtures	
Recessed can	Count of recessed can fixtures	
Recessed lighting Other	Count of recessed lighting other fixtures	
Table lamps	Count of table lamps	
Torchiere	Count of torchieres	
Track lighting	Count of track lighting fixtures	
Under Counter	Count of under counter fixtures	
Wall mount	Count of wall mount fixtures	

Rooms – Lamps Table

The Rooms – Lamp Table provides, for each room type including the whole house, the total number of fixtures as well as indicator variables indicating whether the site had a particular fixture type and lamp type combination. Here, the lamp types have been categorized by lamp technology.

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
ROOM	Room Type	
Total Lamps	Total Number of Lamps	
CF-I-A	Number of A-type compact fluorescent lamps with an integrated ballast	
CF-I-CAP	Number of capsule compact fluorescent lamps with an integrated ballast	
CF-I-CIRC	Number of circline-type compact fluorescent lamps with an integrated ballast	
CF-I-DEC	Number of decorative-type compact fluorescent lamps with an integrated ballast	
CF-I-FLOOD	Number of flood-type compact fluorescent lamps with an integrated ballast	
CF-I-GLO	Number of globe-type compact fluorescent lamps with an integrated ballast	
CF-I-SPRN	Number of spring-type compact fluorescent lamps with an integrated ballast	
CF-I-TUBE	Number of tube-type compact fluorescent lamps with an integrated ballast	
CF-I-UNK	Number of unknown type compact fluorescent lamps with an integrated ballast	
CF-MINI	Number of miniature compact fluorescent lamps	
CF-PIN-BASE	Number of pin based compact fluorescent lamps with an integrated ballast	
F-12	Number of F-12 fluorescent lamps	
F-4	Number of F-4 fluorescent lamps	
F-5	Number of F-5 fluorescent lamps	
F-8	Number of F-8 fluorescent lamps	
F-CIR	Number of circline fluorescent lamps	
F-OTH	Number of other fluorescent lamps	
F-TUBE-UNK	Number of unknown fluorescent lamps	
HAL-MR	Number of halogen MR lamps	
HAL-OTH	Number of other halogen lamps	
HAL-PAR	Number of halogen PAR lamps	
HAL-QTZTUB	Number of halogen quartz tube lamps	
HAL-UNK	Number of unknown halogen lamps	
HEAT LAMP	Number of heat lamps	
I-DEC	Number of incandescent decorative lamps	
I-FLOOD	Number of incandescent flood lamps	

I-GLO	Number of incandescent globe lamps	
I-MINI	Number of incandescent mini lamps	
I-OTH	Number of other incandescent lamps	
I-STD	Number of incandescent standard A-type lamps	
I-UNK	Number of unknown incandescent lamps	

Torchiere Lamp Types Table

The Torchiere Lamp Types table provides the total number of torchieres as well as the number of torchieres in the home containing each lamp type.

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Number of Torchieres	Number of Torchieres in the Home	
TO CFU	Number of Torchieres Containing a Compact Fluorescent Unknown Lamp	
TO CI	Number of Torchieres Containing a Compact Fluorescent Integral Lamp	
TO CO	Number of Torchieres Containing a Compact Fluorescent Other Lamp	
TO FC	Number of Torchieres Containing a Fluorescent Circline Lamp	
TO HO	Number of Torchieres Containing a Halogen Other Lamp	
TO HT	Number of Torchieres Containing a Halogen Tubular Lamp	
TO IA	Number of Torchieres Containing a Standard Incandescent Lamp	
TO ID	Number of Torchieres Containing an Incandescent Decorative Lamp	
TO IR	Number of Torchieres Containing an Incandescent Reflector Lamp	

Category Queries

Categories – Gen

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence

Rent or Own	Ownership Status of Residence
State	State where Residence is Located
Stratum	Stratification Variable

Categories – Rooms

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
State	State where Residence is Located
Stratum	Stratification Variable
Room	Room Type (required for all queries in this category)

Analysis Queries

Gen - Average Lamps Per Fixture – SBA

Basis	Special Basis Query: SB - Rooms - Average Lamps Per Fixture
Description	Returns the average number of lamps in each fixture type

Gen - Average Num CF in Homes with CF

Basis	One for all homes with at least one CFL
Description	Returns the average number of CFLs in Homes that have at least one CFL

Gen - Average Number of Fixtures by Type

Basis	One for all homes
Description	Returns the average number of fixtures per home

Gen - Average Number of Lamps by Base Type

Basis	One for all rooms
Description	Returns the average number of lamps per home by base type (screw-base or pin-base)

Gen - Average Number of Lamps by Type

Basis	One for all lamp types
Description	Returns the average number of lamps for each technology type

Gen - Ceiling Fan Base Type

Basis	The number of ceiling fan fixtures in the home
Description	Returns the percentage of pin and screw based ceiling fan fixtures

Gen – HasCFan

Basis	One for all homes
Description	Returns the percentage of homes with at least ceiling fan fixture

Gen - Have Torchiere

Basis	One for all homes
Description	Returns the percentage of homes with at least one torchiere fixture

Gen - Lamp ABB Presence WH

Basis	One for all homes
Description	Returns the percentage of homes with at least one incandescent, fluorescent, compact fluorescent, or halogen lamp.

Gen - LPD by Wiring Status

Basis	The home floor area in square feet
Description	Returns the average wattage per square foot for the homes

Gen – Number of Fixture Bins

Basis	One for all homes
Description	Returns the number of fixtures in a home by bins (1-10,..., 41-50, More than 50)

Gen – Number of Lamps Bins

Basis	One for all homes
Description	Returns the number of fixtures in a home by bins (1-20,..., 81-100, More than 100)

Gen - Percent CFL by Base Type

Basis	The number of lamps in screw-based sockets
Description	Returns the percentage of lamps in screw-based sockets that are CFL

Gen – Percent Lamp Type by Technology

Basis	One for all homes
Description	Returns the percentage of homes that have CFL, fluorescent, incandescent, or halogen lamps

Gen - Percent of Ceiling Fans with Bulb Count

Basis	Number of fans per home
Description	Returns the percentage of homes with 1-8 lamps per ceiling fan fixture (in one lamp increments)

Gen - Percent of Ceiling Fans with Lamp Types

Basis	Number of fans per home
Description	Returns the percentage of different lamp types contained within ceiling fan fixtures

Gen - Percent of Fixtures by Type

Basis	Total fixtures per home
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Description	Returns the percentage composition of fixtures type for the whole house
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Gen - Percent of Fixtures with CFL – SBA

Basis	Special Basis Query: SB - Percent of Fixtures with CFL
Description	Returns the percentage of fixtures that contain a compact fluorescent lamp

Gen - Percent of Homes with CFL Quantity

Basis	One for all sites
Description	Returns the percentage of homes containing 0-Greater than 15 compact fluorescent lamps (in one CFL increments)

Gen- Percent of Lamps by Base Type

Basis	Sub – Percent of Lamps by Base Type
Description	Returns the percentage of all lamps that are pin-based or screw-based

Gen - Percent of Torchieres with Lamp Types

Basis	Number of Torchieres per Home
Description	Returns the percentage of different lamp types contain in Torchiere fixtures

Gen – Presence of Fixture Type WH

Basis	One for each home
Description	Returns which fixture types are present in each home

Gen - Presence of Lamp Type by Technology

Basis	One for each home
Description	Returns which lamp types are present in each home

Gen - Presence of Lamp Type in Home

Basis	One for all homes
Description	Returns the percentage of homes that have specific lamp types

Gen – Recessed can overview

Basis	One if recessed can is present; 0 if not present
Description	Returns the average number of pin vs. screw based recessed can fixtures

Gen – Recessed Can Overview2

Basis	Rooms – Recessed Can Overview 2
Description	Returns the percent of recessed can fixtures with screw based CFLs

Gen – Recessed Can Overview3

Basis	Rooms – Recessed Can Overview 3
Description	Returns the percentage of pin based and screw based CFLs in recessed can fixtures

Gen – Specific Fixture Overview WH

Basis	Total fixtures per home
Description	Returns the percentage composition of fixtures type for the whole house

Rooms - Average Fixture Wattage – SBA

Basis	Special Basis Query: SB - Rooms - Average Fixture Wattage
Description	Returns the average wattage for each fixture per room and whole house

Rooms - Average Lamp Wattage – SBA

Basis	Special Basis Query: SB - Rooms - Average Lamp Wattage
Description	Returns the average wattage for each lamp type per room and whole house

Rooms - Average LampABB Wattage – SBA

Basis	One for all rooms
Description	Returns the average lamp wattage for CFL, fluorescent, incandescent and halogen lamps

Rooms - Average Number of Lamps by Base Type

Basis	One for all rooms
Description	Returns the average number of lamps per home by base type (screw-base or pin-base)

Rooms – Ceiling Fan Overview

Basis	One if ceiling fan is present; 0 if not present
Description	Returns the average number of pin vs. screw based ceiling fan fixtures

Rooms – Ceiling Fan Overview2

Basis	Count of ceiling fans with screw type bases
Description	Returns the percentage of ceiling fans with screw type bases that have CFLs

Rooms – Ceiling Fan Overview3

Basis	Count of all ceiling fans
Description	Returns the percentage of pin vs. screw based ceiling fan fixtures

Rooms - Lamp and Fixture Combo Presence

Basis	One for all rooms
Description	Returns the percentage of rooms that contain fixture types and fixture/generic lamp combinations

Rooms - LampABB by FIX TYP

Basis	Number of fixtures per room and whole house
Description	Returns the percentage of fixture/generic lamp combinations per room and whole house

Rooms - LampABB Presence

Basis	One for all rooms and whole house
Description	Returns the percentage of rooms and homes that contain generic lamp types (CFL, T12, T8, and Other Tube Fluorescent, Incandescent, Halogen, and High Intensity Discharge)

Rooms - Percent Generic Lamp Types Large

Basis	The total number of lamps per room and whole house
Description	Returns the percentage of lamps that are compact fluorescent, tube fluorescent, halogen, incandescent, or high intensity discharge

Rooms - Percent of Lamps by Control

Basis	Total number of lamps per home
Description	Returns the percentage of lighting control types for each room and the whole house

Rooms - Percent of Lamps by Control and Lamp Type

Basis	Total number of lamps home
Description	Returns the percentage of generic lamp types (CFL, T12, T8, and Other Tube Fluorescent, Incandescent, Halogen, and High Intensity Discharge) by control type for each room and the whole house

Rooms - Percent of Lamps by Control and Lamp Type All

Basis	One for all homes
Description	Returns the percentage of generic lamp types (CFL, T12, T8, and Other Tube Fluorescent, Incandescent, Halogen, and High Intensity Discharge) by control type for the whole house

Rooms - Percent of Lamps by Type

Basis	Total number lamps per home
Description	Returns the percentage of all lamp types per room and whole house

Rooms - Presence of Fixture Type

Basis	One for all homes
Description	Returns the percentage of homes with the different fixture types

Rooms - Presence of Generic Lamp Types

Basis	One for all homes
Description	Returns the percentage of homes with the given lamp types

Rooms - Presence of Lamp Type

Basis	One for all homes
Description	Returns the percentage of homes with the different lamp types

Rooms – Recessed Can Overview

Basis	One for all recessed can fixtures
Description	Returns average number of recessed can fixtures with pin base or screw base

Rooms – Recessed Can Overview2

Basis	Count of all recessed cans with screw bases
Description	Returns the percentage of recessed cans with screw based CFLs

Rooms – Recessed Can Overview3

Basis	Count of all recessed cans
Description	Returns the percentage of recessed cans with pin based vs. screw based CFLs

Rooms - Room Wattage

Basis	One for all rooms and homes
Description	Returns the average wattage for each room and whole house, as well as the relative proportion of the total wattage contributed by standard screw-base lamps (excluding CFLs), CFL, and non-standard base lamps

Rooms - Specific Fixture Overview

Basis	One for all homes
Description	Returns the percentage of homes containing ceiling fans, recessed cans, and torchiere, and (if present in the home) percentage of homes with those fixtures in bins

Single Family Appliance Data Queries

Appliance Table Definitions

All Refrigerators Table

Field Heading	Value	Comments
RLWID	RLW Site Identification Number	
FridgeType	Standard, side by side, freezer on bottom, single door	
YearsOld	Age of refrigerator in years	
Options	Icemaker, water and ice service in door, none	
SizeRange	Small, medium, large, very large	
MFG	Name of manufacturer	
ModelNo	Model number	
MFGdate	Date of manufacture	
UsageR	Primary or secondary and percentage of year in use (0-25%,...,75-100%)	
AEC	Model number parsed for matching	
MModel	Model number parsed for matching	
Match	Matching model number found in efficiency database?	
Notes		

Clothes Dryer Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Dryer Number	1=primary, 2=secondary	Code for primary, secondary dryer
Age of Machine	Resident reported age from on-site	
Fuel Type	Natural Gas, Propane, or Electric	
Usage	Infrequent use, most loads, all loads	
Manufacturer	Manufacturer from on-site	
Model Number	Model number from on-site	
Model_Clean	Model with nonalphanumeric removed	Not Used
Moisture Sensor	Does the unit have moisture sensing	

Cooling System Table

SiteID	RLW Site Identification Number	
Cooling Unit #	Cooling system ID number	Cooling unit#_1 = Primary
System Type	System type (e.g.. split system, win/wall, package, etc.)	
Space or Central	Space or Central System Classification	
Age of System	Customer reported age of system in years old, from on-site	
Manufacturer	Manufacturer of system, from on-site	
Model Number	Model number of system from on-site	
Tons Estimate	Estimated tonnage of cooling system	
Manufacture Date	Date of manufacture from efficiency database	
Cooling System	Y if present, N if not present	
SysCap	Capacity of cooling system	
EER	Matched Efficiency	
SEER	Matched Efficiency	

Dishwasher Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Dishwasher Number	Code for primary or secondary dishwasher	
Age of Dishwasher (in years old)	Age from model number match	
Manufacturer	Manufacturer from on-site	
Manufacturer Date	Date of manufacture	
Model Number	Model number from onsite	
Model_Clean	Model Number with non alphanumeric removed	
Energy Factor	Energy Factor	[load/kWh]-from database
Source	CEC_ckwa if matched,	CEC_ckwa was only database used

Envelope Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	

Wall Construction Type	Exterior wall construction type	
Wall Insulation R-Value	R-Value of Walls	
Attic R-Value	Batt Insulation (R-Value)	
Floor Insulation (R-Value)	Floor Insulation (R-Value)	
Frame Type	Predominant Window Frame Type	
Number of Panes	Average Number of Panes per Window	
LowE	Low-e coating on windows	
Storm	Storm windows	
Crawl/Venting	Is the crawl space vented	
Basement	Does the home have a basement	

General Information Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Type of Residence	Single Family Home, Apartment, etc.	
Total People	Total Number of Residents at Site	
Total Adults	Total Number of Adults at Site	18 and Over
People	Total Number of Residents at Site	Converted from text to number
Adults	Total Number of Adults at Site	Converted from text to number
People Under 1 year	Total Number of People Under 1 Year at Site	
People 2 to 5 years	Total Number of People between 2 to 5 years at site	
People 6 to 18 years	Total Number of People between 6 to 18 years at site	
People 18 to 29 years	Total Number of People between 18 to 29 years at site	
People 30 to 49 years	Total Number of People between 30 to 49 years at site	
People 50 to 64 years	Total Number of People between 50 to 64 years at site	
People 65 or more years	Total Number of People over 65 years at site	
Income	Annual Household Income Range	Resident Supplied
Total Heated Sqft	Square Footage Range of Residence	
Age Range	Age Range of Residence	
Rent or Own	Ownership Status of Residence	
Who Pays Electric? (Occ or Landlord)	Responsibility for Electric Bill	
Who Pays Gas?	Responsibility for Gas Bill	
Total Heated Floorspace	Square Footage of Heated Floorspace of Residence	

Heating System

SiteID	RLW Site Identification Number	
Furnace #	Furnace ID number	Furnace#_1 = Primary
Space or Central	Space or Central System Type	
Fuel Type	Fuel type of system (i.e. electric, gas wood, etc.)	
System Type	System type (i.e. forced air furnace, baseboard, wall, etc.)	
Age of System	Customer reported age of system in years old.	From on-site
Manufacturer	On-site name of furnace manufacturer	From nameplate
Model Number	On-site model number	From nameplate
Model_Clean	Model number with all alphanumeric symbols removed	
Input	CEC_cent input capacity (kBtuh)	
Output	CEC_cent output capacity (kBtuh)	
afue1	Annual Fuel Utilization Efficiency for unit if matched	
Manufacture Date	Date of manufacture	
HP_HSPF	Efficiency of heat pump	
HP_Output	Output of heat pump	

Pool Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Heated	Is pool heated	
FuelTyp	Fuel type for heater	

Washing Machine Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Washing Machine #		
Type of Washer	Standard or Horizontal Axis	
Age of Machine (in years old)	Age from model number match	
Age of Machine	Resident reported age	
Manufacturer	Manufacturer from on-site	
Model Number	Model Number as recorded from	

	On-site	
Model_Clean	Model Number with non alphanumeric removed	Used for model number to database matching
Type	Numeric Code for Washer Type	
Energy Factor	Energy Factor [cubic feet/kWh]	
Water Factor	Gallon capacity over cubic feet	Not Used
Moisture Content	Remaining water content from CEC_ckwa.dbf database	Not Used
Source	Database from which washer data was extracted	
Age estimate	Resident reported age from on-site	

Spa

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
FuelTyp	Fuel type for heater	

Water Heater Table

Field Heading	Value	Comments
SiteID	RLW Site Identification Number	
Water Heater #	1=primary, 2=secondary	
Fuel Type	Gas or Electric	From on-site
Fuel Type_On Site	Gas, Heat Pump, No Heat Pump	To determine if Electric water heater users have heat pump or not
on-site energy factor	Energy Factor from nameplate	
Size (Gallons)	Storage capacity in Gallons	From on-site
Heater Type	Storage or Instantaneous	
Internal Tank Insulation (R-Value)	R-Value of Internal Tank insulation from on-site	
External Tank Wrap?	Yes -external tank wrap, No wrap	
Age (in years old)	Estimated Age of Water heater in years old	Resident reported
If Electric-KW	Capacity in kW if Electric	
If Gas-kBtuh	Capacity in kBtuh if gas	
Manufacturer	Manufacturer fro on-site	
Model Number	Model number from on-site	
Model_Clean	Model number with non-alphanumerics removed	Used for database matching
Fuel	Electric, Gas	Gas is natural gas or propane
Gallons	Storage capacity in gallons from database match	
Gallons Estimate	Storage capacity in gallons from on-	

	site	
Instant	Yes = Instantaneous , No = storage	Only one instantaneous heater found
Input	Input Capacity Btu or kW from database match	
Efficiency	Efficiency of water heater from database match	No cycling, and transmission losses considered
Annual Energy Consumption	Annual Energy consumption from database matching	Btu for Gas, kWh for electric
Energy Factor	Energy Factor from database matching	Energy Factor for water heater is unitless, (water heater delivered energy/energy consumed)
Source	CEC_gwh for matched gas heaters, CEC_ewh for matched electric water heaters	
Age Estimate	Estimated Manufacture Date from on-site	(2000-Age in years old)

Category Queries

Categories-Cooling

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People in Home	Total Number of Residents at Site
Total Adults in Home	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter
State	State where home is located
Stratum	Stratification variable
Central or Space	Space Units Serve a Single Area; Central Units Serve the Whole Home
Type of System	Split System AC, Wall/Window Unit, etc.
Cooling Tons	Capacity of System in Half Ton Bins (i.e. 0.5-0.99 tons, 1-1.49 tons, ..., greater than 5 tons)
System Age	Age of System (in Five Year Bins- 1990-1994, 1995-1999, etc)

Categories-Dishwasher

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People in Home	Total Number of Residents at Site

Total Adults in Home	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter
State	State where home is located
Stratum	Stratification variable
System Age	Age of System (in Five Year Bins- 1990-1994, 1995-1999, etc)

Categories-Dryer

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter
State	State where home is located
Stratum	Stratification variable
System Age	Age of System (in Five Year Bins- 1990-1994, 1995-1999, etc)

Categories-Dryer EFF

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter
State	State where home is located
Stratum	Stratification variable
System Age	Age of System (in Five Year Bins- 1990-1994, 1995-1999, etc)

Categories-Envelope

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter
State	State where home is located
Stratum	Stratification variable
Wall Construction Type	2 x 4, 2 x 6, Masonry, etc.
Basement Type	Finished, unfinished, conditioned, unconditioned

Categories—Gen

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter
State	State where home is located
Stratum	Stratification variable

Categories-Heating

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter

State	State where home is located
Stratum	Stratification variable
Fuel	Electric, Gas, Pellet, Propane, Wood
Central or Space	Space Units Serve a Single Area; Central Units Serve the Whole Home
Type	Forced Air Furnace, Floor, Wall Unit w/Fan, etc.
System Age	Age of System (in Five Year Bins- 1990-1994, 1995-1999, etc)

Categories-Pool

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter
State	State where home is located
Stratum	Stratification variable
Fuel	Electricity, Gas, Propane, Solar

Categories-Pri Refrigerator

SiteID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter
State	State where home is located
Stratum	Stratification variable
Refrigerator Type	Freezer On Bottom, Built-In, Side-By-Side, Top Mounted Freezer, etc
Refrigerator Size	<=10, 11-14, 15-18, 19-22, and >22
Refrigerator Age	Age of System (in Five Year Bins- 1990-1994, 1995-1999, etc)

Categories-Pri Refrigerator EFF

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.

Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter
State	State where home is located
Stratum	Stratification variable
Refrigerator Type	Freezer On Bottom, Built-In, Side-By-Side, Top Mounted Freezer, etc
Refrigerator Size	<=10, 11-14, 15-18, 19-22, and >22
Refrigerator Age	Age of System (in Five Year Bins- 1990-1994, 1995-1999, etc)

Categories-Sec Refrigerator

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter
State	State where home is located
Stratum	Stratification variable
Refrigerator Type	Freezer On Bottom, Built-In, Side-By-Side, Top Mounted Freezer, etc
Refrigerator Size	<=10, 11-14, 15-18, 19-22, and >22
Refrigerator Age	Age of System (in Five Year Bins- 1990-1994, 1995-1999, etc)

Categories-Sec Refrigerator EFF

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter

State	State where home is located
Stratum	Stratification variable
Refrigerator Type	Freezer On Bottom, Built-In, Side-By-Side, Top Mounted Freezer, etc
Refrigerator Size	<=10, 11-14, 15-18, 19-22, and >22
Refrigerator Age	Age of System (in Five Year Bins- 1990-1994, 1995-1999, etc)

Categories-Spa

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter
State	State where home is located
Stratum	Stratification variable

Categories-Washer

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
System Age	Age of System (in Five Year Bins- 1990-1994, 1995-1999, etc)
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter
State	State where home is located
Stratum	Stratification variable
Type of Washer	Standard, Horizontal Axis, or Stacked

Categories-Washer EFF

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range

Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter
State	State where home is located
Stratum	Stratification variable
System Age	Age of System (in Five Year Bins- 1990-1994, 1995-1999, etc)
Type of Washer	Standard, Horizontal Axis, or Stacked

Categories-Water Heater

Site ID	RLW Site Identification Number
Weight	Case weight
Type of Residence	Single Family Home, Apartment, etc.
Total People	Total Number of Residents at Site
Total Adults	Total Number of Adults at Site
Income	Annual Household Income Range
Year Occupied	Year Occupied
Total Heated Floorspace	Square Footage Range of Residence
Rent or Own	Ownership Status of Residence
Who Pays Electric	Owner or renter
Who Pays Gas	Owner or renter
State	State where home is located
Stratum	Stratification variable
Fuel	Electric, Gas, or Propane
Size	Tank Size (in Ten Gallon bins)
Unit Type	Storage or Instantaneous
System Age	Age of System (in Five Year Bins- 1990-1994, 1995-1999, etc)

Analysis Queries

Cooling Efficiency Average

Basis	One for all homes where a SEER value was obtained
Description	Returns the average SEER value

Cooling Efficiency Bins

Basis	One for all homes where a SEER value was obtained
Description	Returns the average SEER value as well as percentage of units contained within SEER bins (8-8.99, 9-9.99, etc.)

Cooling Efficiency Relative to Standards

Basis	One for all homes with central systems where SEER value was obtained
Description	Returns the average SEER value as well as percentage of units contained within SEER bins (bins based on the federal efficiency standards)

Cooling Estimated Age Avg and Bins

Basis	One for all homes where the age of the cooling system was obtained
Description	Returns the average age as well as the percentage of units by year (2006, 2005, etc.)

Cooling Primary System Type

Basis	One for all homes where the system type is known (excluding whole house fans)
Description	Returns the percentage of homes with system types, including heat pump, split AC, packaged AC, window unit, and portable

Cooling Proportions

Basis	One for all homes
Description	Returns the proportion of homes which fall into the user selected group by variable

Cooling Space or Central

Basis	One for all homes where the system is known to be either a space or central system
Description	Returns the percentage of homes that are cooled by a space or central air conditioning unit

Cooling System Saturation

Basis	One for all homes with cooling
Description	Returns the percentage of homes with cooling

Cooling Ton Bins

Basis	One for all homes where the capacity of the unit is known
Description	Returns the percentage of units contained with ½ ton bins (i.e. 0.5-0.99 tons, 1-1.49 tons, ..., greater than 5 tons)

Dishwasher Age Avg and Bins

Basis	One for all homes in which the dishwasher age is known
Description	Returns the average age as well as the percentage of units in three year bins (2006-2004, 2003-2001, etc.)

Dishwasher Average Energy Factor

Basis	One for all homes in which the dishwasher energy factor is known
Description	Returns the average energy factor

Dishwasher Energy Factor Bins

Basis	One for all homes in which the dishwasher energy factor is known
Description	Returns the percentage of dishwashers in energy factor bins (0.275 to 0.459,

	0.460 to 0.579, 0.580 to 0.775)
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Dishwasher Homes with Dishwasher

Basis	One for all homes
Description	Returns the percentage of homes that contain a dishwasher

Dryer EFF Average Energy Factor

Basis	One for all dryers where energy factor was determined
Description	Returns the average energy factor

Dryer Estimated Age Avg and Bins

Basis	One for all homes in which the dryer age is known
Description	Returns the average age as well as the percentage of units in five year bins (1990-1994, 1995-1999, etc.)

Dryer Fuel Type

Basis	One for all homes that have a clothes dryer
Description	Returns the percentage of clothes dryers by fuel type (Electric, Gas, Propane)

Dryer Has Moisture Sensor

Basis	One for all dryers
Description	Returns the percentage dryers which had a moisture sensor

Dryer Homes with Dryers

Basis	One for all homes
Description	Returns the percentage of homes that contain a clothes dryer

Envelope Attic Insulation R-Value Bins

Basis	One for all homes where the attic r-value is known
Description	Returns the average attic r-value as well as the percentage of homes with attic r-values in bins

Envelope Floor Insulation R-Value

Basis	One for all homes where the floor r-value is known, and is not adiabatic or slab-on-grade
Description	Returns the percentage of homes in specific r-values

Envelope proportions of basement type

Basis	One for all homes
Description	Returns the proportion of homes with basements

Envelope Wall Construction Type

Basis	One for all homes
Description	Returns the percentage of homes whose wall construction is 2x4, 2x6, Masonry, or Unknown

Envelope Wall Insulation R-Value

Basis	One for all homes where the wall r-value is known
Description	Returns the percentage of homes in specific r-values

Envelope Window Frame by Pct of Win Area

Basis	The total window square footage, unless unknown
Description	Returns the percentage of all window area by frame type

Envelope Window Frame Type

Basis	One for all homes where the frame type is known
Description	Returns the percentage of homes with specified frame types (Metal, Non-metal)

Envelope Window Frame Type by Num Panes

Basis	One for all homes where the frame type is known
Description	Returns the percentage of homes with specified frame types and number of panes (Metal, Non-metal, and Single or Double-paned)

Envelope Window LowE

Basis	One for all homes where the frame type is known
Description	Returns the percentage of homes with specified glass types (Clear or Low-E)

Envelope Window Pct LowE

Basis	The total window area unless the frame type is unknown
Description	Returns the percentage of homes with specified glass types (Clear or Low-E)

Envelope Window to Floor Percent

Basis	The total conditioned floor area
Description	Returns the ratio of window to floor area

Gen Average Floor Area

Basis	One for all homes
Description	Returns the average floor area

Gen Consumer Electronics

Basis	One for all homes where the number of consumer electronics is known
Description	Returns the average number of consumer electronics in the home

Gen Demographic Proportions

Basis	One for all homes
Description	Returns the proportion of homes which fall into the user selected group by variable

Gen Large Appliances

Basis	One for all homes
Description	Returns the percentage of homes with specified large appliances

Gen Pays Electric Bill-Non Owners

Basis	One for all homes
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Description	Returns the percentage of homes by electricity bill payer (Landlord, Occupant, or Unknown)
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Gen Pays Gas Bill-Non Owners

Basis	One for all homes
Description	Returns the percentage of homes by gas bill payer (Landlord, Occupant, or Unknown)

Gen Thermostat Types

Basis	One for all homes where the thermostat type is known
Description	Returns the percentage of homes by type of thermostat (Mechanical, Digital, Hybrid)

Heating AFUE Bins

Basis	One for all homes where the heating system's efficiency is known (excludes heat pumps)
Description	Returns the percentage of heating systems that fall into specified bins

Heating Average AFUE

Basis	One for all homes where the heating system's efficiency is known (excludes heat pumps)
Description	Returns the average AFUE

Heating Capacity Bins

Basis	One for all homes whose heating system's capacity is known (excludes heat pumps)
Description	Returns the percentage of heating systems that fall into specified bins

Heating Estimated Age Bins

Basis	One for all homes in which the heating system age is known
Description	Returns the average age as well as the percentage of units by year

Heating Fuel Types

Basis	One for all homes where there is a heating system
Description	Returns the percentage of homes with the specified fuel types

Heating HeatPump HSPF Output Averages

Basis	One for all homes where there is a heat pump with a known HSPF and output capacity
Description	Returns the average HSPF and output capacity

Heating HeatPump HSPF Output Bins

Basis	One for all homes where there is a heat pump with a known HSPF and output capacity
Description	Returns the percentage of heat pumps that fall within HSPF and capacity bins

Heating Number of Heating Systems

Basis	One for all homes
Description	Returns the percentage of homes with 0 – 5 heating systems

Heating Primary System Type

Basis	One for all homes with heating systems where the fuel type is known
Description	Returns the percentage of homes with specified primary system types

Heating Proportions

Basis	One for all homes
Description	Returns the proportion of homes which fall into the user selected group by variable

Pct LowE

Basis	N/A
Description	Returns percentage of window square footage that is Low-e

Pool Fuel Types

Basis	One for all homes that have a pool
Description	Returns the percentage of fuel types of pools as well as percentage of pools that we not heated

Pool Saturation

Basis	One for all homes that have a pool
Description	Returns the percentage homes with pools

Pri Refrigerator EFF AEC Bins

Basis	One for all primary refrigerators which had an annual energy consumption match from the appliance efficiency databases
Description	Returns the percentage of primary refrigerators that fall into specified bins of annual energy consumption

Pri Refrigerator EFF Avg Energy Consumption

Basis	One for all primary refrigerators which had an annual energy consumption match from the appliance efficiency databases
Description	Returns the average annual energy consumption of primary refrigerators

Pri Refrigerator EFF Consumption to Natl Stnd

Basis	One for all primary refrigerators which had all the necessary information with which to calculate the federal energy use standard
Description	Returns the average percentage of energy use for the primary refrigerator compared to the federal standard

Pri Refrigerator EFF Consumption to Natl Stnd Bins

Basis	One for all primary refrigerators which had all the necessary information with which to calculate the federal energy use standard
Description	Returns the average percentage of energy use for the primary refrigerator compared to the federal standard, as well as the percentage of refrigerators that

	fall into specified bins
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Pri Refrigerator EFF Energy Star

Basis	One for all primary refrigerators which had all the necessary information with which to calculate the federal energy use standard
Description	Returns the percentage of refrigerators that meet the ENERGY STAR qualifications as of 2001 and 2004

Pri Refrigerator Estimated Manufacture Date

Basis	One for all homes in which the refrigerator estimated or manufactured age is known
Description	Returns the average age as well as the percentage of units in five year bins (1990-1994, 1995-1999, etc.)

Pri Refrigerator Homes with 2 or 3 Refrigerators

Basis	One for all homes
Description	Returns the percentage of homes with two or three refrigerators, either full-sized or compact

Pri Refrigerator Types

Basis	One for all homes
Description	Returns the percentage of refrigerators that fall into the specified refrigerator types

Pri Refrigerator Volume

Basis	One for all primary refrigerators which had a volume matched from the appliance efficiency databases
Description	Returns the average volume in cubic feet for primary refrigerators

Pri Refrigerator Volume Bins

Basis	One for all primary refrigerators where the range of volume is known
Description	Returns the percentage of primary refrigerators that fall into specified volume ranges

Sec Refrigerator EFF AEC Bins

Basis	One for all secondary refrigerators which had an annual energy consumption match from the appliance efficiency databases
Description	Returns the percentage of secondary refrigerators that fall into specified bins of annual energy consumption

Sec Refrigerator EFF Avg Energy Consumption

Basis	One for all secondary refrigerators which had an annual energy consumption match from the appliance efficiency databases
Description	Returns the average annual energy consumption of secondary refrigerators

Sec Refrigerator EFF Consumption to Natl Stnd

Basis	One for all secondary refrigerators which had all the necessary information with
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	which to calculate the federal energy use standard
Description	Returns the average percentage of energy use for the secondary refrigerator compared to the federal standard

Sec Refrigerator EFF Consumption to Natl Stnd Bins

Basis	One for all secondary refrigerators which had all the necessary information with which to calculate the federal energy use standard
Description	Returns the average percentage of energy use for the secondary refrigerator compared to the federal standard

Sec Refrigerator EFF Energy Star

Basis	One for all secondary refrigerators which had all the necessary information with which to calculate the federal energy use standard
Description	Returns the percentage of refrigerators that meet the ENERGY STAR qualifications as of 2001 and 2004

Sec Refrigerator Estimated Manufacture Date

Basis	One for all homes in which the refrigerator estimated or manufactured age is known
Description	Returns the average age as well as the percentage of units in five year bins (1990-1994, 1995-1999, etc.)

Sec Refrigerator Types

Basis	One for all homes with a secondary refrigerator
Description	Returns the percentage of refrigerators that fall into the specified refrigerator types

Sec Refrigerator Volume

Basis	One for all secondary refrigerators which had a volume matched from the appliance efficiency databases
Description	Returns the average volume in cubic feet for secondary refrigerators

Sec Refrigerator Volume Bins

Basis	One for all secondary refrigerators where the range of volume is known
Description	Returns the percentage of secondary refrigerators that fall into specified volume ranges

Spa Fuel Type

Basis	One for all homes with a spa
Description	Returns the percentage of homes with spas with respect to heating fuel type

Spa Saturation

Basis	One for all homes with a spa
Description	Returns the percentage of homes with a spa

Washer Age Avg and Bins

Basis	One for all homes in which the washing machine age is known
Description	Returns the average age as well as the percentage of units in five year bins (1990-1994, 1995-1999, etc.)

Washer EFF Average Energy Factor

Basis	One for all homes with clothes washers where the energy factor is known
Description	Returns the average energy factor

Washer EFF Average Modified Energy Factor

Basis	One for all homes with clothes washers where the energy factor is known
Description	Returns the percentage of clothes washers that fall into specified energy factor bins

Washer EFF MEF Bins

Basis	One for all homes with clothes washers where the modified energy factor is known
Description	Returns the average modified energy factor

Washer Homes with Washing Machine

Basis	One for all homes
Description	Returns the percentage of homes that contain a clothes washer

Washer Type of Washer

Basis	One for all homes with a clothes washer
Description	Returns the percentage of clothes washers that are horizontal axis, stacked, or standard axis

Water Heater Average Energy Factor

Basis	One for all homes where the water heater energy factor is known
Description	Returns the average energy factor

Water Heater Energy Factor Bins

Basis	One for all homes where the water heater energy factor is known
Description	Returns the percentage of water heaters with energy factors that fall into specified bins

Water Heater Estimated Average Age and Bins

Basis	One for all homes in which the water heater age is known
Description	Returns the average age as well as the percentage of units in three year bins (2006-2004, 2003-2001, etc.)

Water Heater Fuel Type

Basis	One for all water heaters with known fuel types
Description	Returns the percentage of water heaters that are heated by electricity, natural gas, propane, and solar

Water Heater Proportions

Basis	One for all homes
Description	Returns the proportion of homes which fall into the user selected group by variable

Water Heater Size Avg and Bins

Basis	One for all water heaters that have a known tank capacity
Description	Returns the average water heater tank capacity, as well as the percentage of tanks that fall into specified bins

Water Heater Tank Wrap

Basis	One for all water heaters
Description	Returns the percentage of water heaters that were either covered or not covered by an external insulating blanket, and those where the blanket status was unknown

WindowArea by frame type

Basis	N/A
Description	Returns the window square footage for each frame type

Water Heater Efficiency Standards Calculation Table

Water Heater Type	Federal Energy Factor Standard as of January 20, 2004	Federal Energy Factor Standard as of April 15, 1991
Gas-fired Water Heater	$0.67 - (0.0019 \times \text{Rated Storage Volume (gal.)})$	$0.62 - (0.0019 \times \text{Rated Storage Volume (gal.)})$
Oil-fired Water heater	$0.59 - (0.0019 \times \text{Rated Storage Volume (gal.)})$	$0.59 - (0.0019 \times \text{Rated Storage Volume (gal.)})$
Electric Water Heater	$0.97 - (0.0019 \times \text{Rated Storage Volume (gal.)})$	$0.93 - (0.0019 \times \text{Rated Storage Volume (gal.)})$
Tabletop Water Heater	$0.93 - (0.0019 \times \text{Rated Storage Volume (gal.)})$	$0.93 - (0.0019 \times \text{Rated Storage Volume (gal.)})$
Instantaneous Gas-fire Water Heater	$0.62 - (0.0019 \times \text{Rated Storage Volume (gal.)})$	$0.62 - (0.0019 \times \text{Rated Storage Volume (gal.)})$
Instantaneous Electric Water Heater	$0.93 - (0.0019 \times \text{Rated Storage Volume (gal.)})$	$0.93 - (0.0019 \times \text{Rated Storage Volume (gal.)})$

Databases

Overview

The data collected during the 804 on-site visits are contained in six final databases. One database contains all appliance and envelope information for single-family residences; another contains all the single-family lighting information. Two identical databases contain the multifamily data. The fifth database contains the single-family testing data, and the final database contains the multifamily common area data.

These databases are in MS Access format. In addition to the surveyor information collected on site, the appliance database contains all information linked from the efficiency databases that pertains to the appliance models in the sample, and contains the efficiency categories that were created in order to analyze the data.

The data on each appliance in the appliance database are located in separate tables. Queries have been set up that allow the user to analyze some key questions for each appliance/lighting fixture/lamp. All of the summary tables in this report have been obtained from queries performed on the project databases.

The following is a list of the steps that were taken to ready the databases for delivery:

- Consolidation of Surveyor Information
- Cleaning of Surveyor Information
- Merge of Weights
- Acquisition of Efficiency Databases to Link with Surveyor Data
- Creation of Efficiency Categories
- Creation of Analysis Queries
- Efficiency Weighting Adjustments for Unmatched Appliances
- Development of Database Summarization Tool

This section contains a description of the databases and the steps taken to prepare the databases for analysis and delivery. However, for a complete description of each table and query see the appendix to this report.

Consolidation of Surveyor Information

During the site visit, the surveyors entered all information directly into a palmtop computer as the survey was completed. The hand-held application was designed to download all on-site data to an SQL database that is hosted at RLW's Sonoma office. As the data were consolidated, an automated QC process, in addition to a manual QC process were performed.

Merge of Weights

Once the sites were merged and cleaned in the central database, the sample design case weights for the analysis were merged into the database in the 'General Information' table. Each site in a given stratum was given a corresponding case weight that we define to be the number of sites in the population that the site is thought to represent. The following formula defines

the stratum weight to be the ratio of the number of sites in the population in that stratum to the number of sites in the sample in that stratum.

$$w_h = N_h / n_h, \text{ where } h \text{ is the stratum number}$$

These weights were used to expand the sample to the population.

Merging of Saturation and Efficiency Information

The surveyors were able to observe make and model number on-site, but in most cases, not energy efficiency. The RLW team used all available resources to match the model numbers collected on-site with a reliable source of efficiency ratings and/or Unit Energy Consumption (UEC). Sources that were used included:

- 2005 California Energy Commission Database of Energy Efficient Appliances,
- 2004 Federal Trade Commission (FTC) databases,
- 2003 AHAM Refrigeration database,
- 2003 Carriers Electronic Blue Book of Heating and Cooling Equipment, and
- 2000 ARI HVAC database.

RLW matched the on-site information by model number with standard efficiency ratings for each end-use. For example, in the case of residential cooling, the energy efficiency rating is provided in SEER, or Seasonal Energy Efficiency Ratio units. End-uses that do not have an associated standard efficiency rating (e.g., refrigerators) are characterized in terms of nameplate annual unit energy consumption or UEC.

The difficulty in matching model numbers should not be underestimated by anyone wishing to conduct this type of study in the future. RLW invested a lot of time manually linking sites, as a result of model number wildcards and irregular alphanumeric characters such as dashes, hyphens, slashes, stars, and other text. These characters made automated matching difficult and resulted in a more rigorous model number matching effort.

Creation of Efficiency Categories

Efficiency bins were determined for each appliance type based upon the distribution of the efficiencies. Size and age categories were also altered for each appliance. The size ranges were determined by the distribution of the sizes of each appliance. The efficiency, size and age categories were linked to the surveyor information using logic statements built into the analysis queries.

Creation of Analysis Queries

Analysis queries for each appliance were created in MS Access in order to answer some key questions on market saturation. These queries were designed to analyze each appliance by age, type, size, and any other energy consumption or efficiency variable. Analysis queries were also established for the lighting databases. These analysis queries were designed specifically for the Model Bases Statistical Sampling (MBSS) program to analyze the data using ratio estimation techniques. More information on the format of each query is provided in the appendix.

Efficiency Weighting Adjustments for Unmatched Appliances

RLW performed a weighting adjustment to the appliance efficiency data for refrigerators, clothes washers, and clothes dryers in order to remove the upward bias in average efficiencies that resulted from the model number matching. Appliances that homeowners would tend to keep during a move (e.g. clothes washers, dryers, and refrigerators) that were manufactured more recently were easier to find matches for than older units. Therefore larger amounts of efficiency data were obtained for newer and potentially more efficient appliances. There is

reason to believe that these uneven match rates produced more efficient overall baseline appliance efficiencies than is actually the case.

Due to the low match rates for the older appliances, the older models were under-represented in the average efficiency calculations relative to their representation in the overall appliance stock. The weighting adjustment serves to increase the weight for each of the matched appliances relative to the number of unmatched appliances in each age range. This adjustment will give the older appliances the appropriate amount of influence on the average efficiencies, and ensures that the matched appliances within each age range have the same proportional representation as the total number of appliances within that age range with and without efficiency.

Below are the steps that were taken to calculate the weight adjustments:

1. Count the total number of appliance by age bins for each appliance (**A**)
2. Count the number of matched appliances by age bins for each appliance (**B**)
3. Divide the total number of appliances by the number of matched appliances by age bin (**A/B**)
4. Multiply the appliance weight by the case weight to project the appliance efficiency to the population (upward adjustment of weight to reflect appliances that were unmatched in each age range)

A weighting adjustment was not applied to any matched appliance with unknown age since we could not be certain that they were representative of all the unmatched, unknown age appliances. Without adjusting the case weights to reflect the match rates by age, the efficiency information would be more heavily influenced by the newer and more efficient appliances. The existing case weights that are used for the majority of the saturation calculations were determined by the original sample design. Note that this was only done for clothes washers, clothes dryers, and refrigerators, as other appliances were installed when the home was built.

Database Summarization Tool (PNWRESEST)

The project will deliver a tool that can be used by program designers, managers, evaluators, and other parties for understanding efficiency and saturation characteristics of Pacific Northwest residences. RLW will use a web-based application that allows multiple users to apply stratified ratio estimation methods to the study data. The application was originally designed for the California Lighting and Appliance Saturation Study and has the ability to:

- Calculate ratio estimates, (e.g., of the saturation level of a set of appliances), classified by any available categorical variable such as age of home, residence type, or state.
- Calculate the underlying sample sizes
- Calculate the appropriate model-based error bounds
- Calculate proportions (e.g., proportion of all cooling units that are space vs. central)

This program can be used to create one-way, two-way or multi-way tables categorizing the market share of specified appliances and measures by any specified dimensions, allowing other parties the ability to produce their own "what-if" trend analyses. The resulting tables can be easily exported to Excel and displayed graphically. The software provided is fully documented in the Appendix, and a help file is available within the software if the user encounters any problems.

The following is a list of some examples of the types of weighted statistics that can be obtained from the database:

- Average Efficiency of primary HVAC and other equipment
- Percentage of Homes with two or three refrigerators
- Average Energy Usage or Wattage of Equipment

This type of information can be developed for all sites, or for various classifications of residences. Using the standard queries that we provide in the database, the sites can be classified by any combination of the following variables:

- Level of Efficiency (by End Use)
- State
- Type of Residence
- Size of Household (Total People or Total Adults)
- Square Footage
- Household Income
- Year Built
- Rent or Own

Few of the results provided in this report are grouped by the aforementioned demographic data. The intent of the study was to collect the data, build a database of information, and provide the interested parties with a tool that could be used to analyze the data. Given this, only top-level analyses were conducted for reporting purposes. However, where the data were thought to differ drastically by the demographics of the household, the data were grouped by the appropriate characteristic.

PNWRESEST Interface

By providing a web-based analysis tool, users have the power to explore the information based on specific needs. This section discusses the technical specifications of PNWRES^{EST}, the Pacific Northwest Residential Efficiency Saturation Tool, to be located at www.pnwreest.com. Once at the site, users can gain access to the full report and user help screens for understanding how to use PNWRES^{EST}.

Users are required to register, for free, in order to access the tool. Registration is an automated process whereby once the user provides their pertinent contact information and valid email address, a unique 8 character password is generated and automatically sent to the user via email. PNWRES^{EST} is a direct port of RLW's MBSS software application. Originally developed in Fortran, MBSS was later reprogrammed in Microsoft Visual Basic in order to support a 32 Bit operating system environment. For the web based tool, all the proprietary algorithms, code and queries were rewritten in CFScript (ColdFusions server-side implementation of Java style classes). This allows the tool to not only process requests more efficiently, but to also be scalable across multiple servers and operating systems.

Single Family Room Lighting Analysis

This section contains lighting results by room type. For each room type, the percentage of homes with a given fixture type and lamp type are shown.

Kitchen

Table 1 presents the percentage of homes with a given fixture type and lamp type in the kitchen along with the associated error bound. The most predominant fixture and lamp type combination is recessed cans with incandescent lamps. Other common combinations include chandelier/hanging and under counter with incandescent lamps, along with under counter with halogen lamps. The most common fixture with CFLs is recessed cans.

Fixture Type (n=598)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	11.5%	2.5%	2.0%	1.2%	4.8%	1.6%	5.6%	1.7%	23.6%	3.6%	91.0%	2.2%
Architecturally Integrated	3.6%	2.2%	0.5%	0.8%	0.3%	0.5%	-	-	0.1%	0.1%	2.0%	1.9%	1.5%	1.1%
Ceiling Fan	0.6%	0.6%	-	-	-	-	-	-	-	-	0.2%	0.4%	0.4%	0.5%
Ceiling Fixtures	16.1%	3.1%	1.6%	1.0%	0.5%	0.5%	2.2%	1.1%	0.4%	0.5%	2.4%	2.0%	11.1%	2.7%
Chandelier Hanging	27.9%	3.4%	2.6%	1.3%	-	-	-	-	-	-	3.9%	1.4%	22.3%	3.2%
Floor Lamp	0.3%	0.4%	-	-	-	-	-	-	-	-	-	-	0.3%	0.4%
Other	1.4%	0.9%	0.1%	0.1%	-	-	-	-	0.1%	0.2%	-	-	1.2%	0.9%
Recessed Can	88.6%	2.8%	8.6%	2.2%	-	-	-	-	-	-	4.7%	1.7%	78.8%	3.4%
Recessed Lighting-Other	1.7%	0.9%	-	-	-	-	0.1%	0.1%	-	-	0.8%	0.7%	1.2%	0.7%
Table Lamps	2.8%	1.3%	0.2%	0.4%	-	-	-	-	-	-	0.5%	0.7%	2.0%	1.1%
Track Lighting	2.9%	1.3%	-	-	-	-	-	-	-	-	1.9%	1.0%	1.0%	0.8%
Under Counter	36.2%	3.8%	1.2%	0.7%	1.4%	1.0%	2.3%	1.1%	4.8%	1.5%	13.1%	2.7%	14.6%	3.0%
Wall Mount	3.0%	1.2%	-	-	-	-	0.2%	0.4%	0.3%	0.4%	0.2%	0.4%	2.4%	1.1%

Table 1: Percentage of Homes with Fixture Type and Lamp Type in Kitchen

Bedrooms

Table 2, Table 3, Table 4, Table 5, and Table 6 present the percentage of homes with a given fixture type and lamp type in the bedrooms, as well as the error bounds associated with these estimates. The most predominant fixture and lamp type combinations are ceiling fans, ceiling mounts, table lamps with incandescent lamps, as well as table lamps containing compact fluorescent lamps.

Fixture Type (n=604)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	16.2%	2.8%	0.1%	0.2%	0.6%	0.5%	0.2%	0.3%	8.6%	2.1%	92.7%	2.0%
Architecturally Integrated	0.9%	0.7%	-	-	-	-	-	-	-	-	0.3%	0.4%	0.8%	0.7%
Ceiling Fan	32.0%	3.6%	2.8%	1.2%	-	-	-	-	-	-	0.1%	0.1%	29.5%	3.6%
Ceiling Fixtures	44.1%	3.9%	3.1%	1.3%	0.1%	0.2%	0.4%	0.4%	0.1%	0.2%	0.3%	0.4%	40.2%	3.8%
Chandelier Hanging	4.7%	1.6%	-	-	-	-	-	-	-	-	-	-	4.7%	1.6%
Floor Lamp	6.7%	1.8%	1.6%	0.9%	-	-	-	-	-	-	0.5%	0.5%	4.9%	1.5%
Other	1.6%	1.9%	0.1%	0.2%	-	-	-	-	-	-	-	-	1.5%	1.8%
Recessed Can	23.3%	3.3%	2.2%	1.2%	-	-	-	-	-	-	3.6%	1.5%	18.0%	2.9%
Recessed Lighting-Other	2.0%	1.0%	-	-	-	-	-	-	-	-	0.6%	0.6%	1.4%	0.8%
Table Lamps	61.0%	3.9%	8.3%	2.0%	-	-	-	-	0.1%	0.1%	2.9%	1.2%	54.0%	3.9%
Torchiere	2.3%	1.1%	0.2%	0.4%	-	-	-	-	-	-	0.8%	0.7%	1.3%	0.8%
Track Lighting	1.3%	1.1%	-	-	-	-	-	-	-	-	0.5%	0.5%	0.8%	1.0%
Wall Mount	8.3%	2.0%	0.8%	0.6%	-	-	0.1%	0.2%	-	-	0.6%	0.6%	6.9%	1.9%

Table 2: Percentage of Homes with Fixture Type and Lamp Type in Master Bedroom

Fixture Type (n=554)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	13.0%	3.1%	0.5%	0.9%	0.2%	0.3%	1.1%	1.0%	6.0%	2.0%	92.5%	2.2%
Architecturally Integrated	0.2%	0.3%	-	-	-	-	-	-	-	-	0.2%	0.3%	-	-
Ceiling Fan	10.1%	2.4%	0.2%	0.3%	-	-	-	-	-	-	-	-	9.9%	2.4%
Ceiling Fixtures	78.0%	3.3%	6.0%	1.9%	-	-	0.2%	0.3%	0.2%	0.3%	1.1%	0.8%	70.9%	3.6%
Chandelier Hanging	2.7%	1.2%	-	-	-	-	-	-	-	-	-	-	2.7%	1.2%
Floor Lamp	7.0%	1.9%	1.0%	0.6%	-	-	-	-	0.2%	0.3%	0.2%	0.4%	5.8%	1.7%
Other	0.6%	0.4%	-	-	-	-	-	-	-	-	0.2%	0.3%	0.4%	0.3%
Recessed Can	10.5%	2.6%	1.9%	1.3%	-	-	-	-	-	-	1.0%	0.9%	7.6%	2.1%
Recessed Lighting-Other	0.6%	0.6%	-	-	-	-	-	-	-	-	0.3%	0.5%	0.3%	0.5%
Table lamps	40.8%	4.0%	3.5%	2.2%	0.5%	0.9%	-	-	-	-	2.1%	1.2%	35.3%	3.8%
Torchiere	2.3%	1.2%	0.5%	0.6%	-	-	-	-	-	-	0.7%	0.6%	1.2%	0.9%
Track Lighting	1.6%	1.0%	-	-	-	-	-	-	-	-	1.0%	0.8%	0.6%	0.7%
Wall Mount	4.3%	1.7%	0.5%	0.6%	-	-	-	-	0.8%	1.0%	-	-	3.0%	1.3%

Table 3: Percentage of Homes with Fixture Type and Lamp Type in Bedroom 1

Fixture Type (n=473)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	12.8%	2.9%	0.1%	0.1%	-	-	0.9%	0.7%	6.4%	2.2%	91.4%	2.6%
Architecturally Integrated	0.4%	0.5%	-	-	0.1%	0.1%	-	-	-	-	-	-	0.3%	0.5%
Ceiling Fan	9.9%	2.6%	0.2%	0.2%	-	-	-	-	-	-	-	-	9.7%	2.6%
Ceiling Fixtures	81.0%	3.4%	7.9%	2.5%	-	-	-	-	0.2%	0.3%	1.1%	0.9%	72.0%	3.9%
Chandelier Hanging	2.3%	1.4%	-	-	-	-	-	-	-	-	-	-	2.3%	1.4%
Floor Lamp	5.2%	2.0%	0.7%	0.7%	-	-	-	-	-	-	0.7%	0.9%	3.9%	1.7%
Other	0.1%	0.2%	-	-	-	-	-	-	-	-	-	-	0.1%	0.2%
Recessed Can	10.0%	2.6%	1.6%	1.2%	-	-	-	-	-	-	0.6%	0.7%	7.8%	2.3%
Recessed Lighting-Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Table lamps	41.5%	4.2%	4.0%	1.5%	-	-	-	-	0.3%	0.3%	2.9%	1.4%	35.1%	4.1%
Torchiere	1.4%	0.8%	0.1%	0.1%	-	-	-	-	0.1%	0.1%	0.9%	0.7%	0.5%	0.5%
Track Lighting	0.3%	0.4%	-	-	-	-	-	-	-	-	-	-	0.3%	0.4%
Wall Mount	3.1%	1.5%	-	-	-	-	-	-	0.3%	0.5%	0.3%	0.5%	2.5%	1.3%

Table 4: Percentage of Homes with Fixture Type and Lamp Type in Bedroom 2

Fixture Type (n=208)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	11.9%	4.4%	-	-	-	-	0.8%	0.9%	5.7%	2.9%	87.7%	4.5%
Ceiling Fan	10.9%	4.5%	0.5%	0.9%	-	-	-	-	-	-	-	-	10.4%	4.4%
Ceiling Fixtures	81.8%	5.4%	8.3%	3.9%	-	-	-	-	0.4%	0.7%	1.3%	1.5%	71.7%	6.3%
Chandelier Hanging	3.2%	2.7%	-	-	-	-	-	-	-	-	-	-	3.2%	2.7%
Floor Lamp	2.1%	1.6%	0.2%	0.3%	-	-	-	-	-	-	0.4%	0.6%	1.6%	1.4%
Other	0.7%	0.8%	-	-	-	-	-	-	0.4%	0.6%	-	-	0.3%	0.5%
Recessed Can	7.7%	3.5%	1.3%	1.5%	-	-	-	-	-	-	1.1%	1.3%	5.9%	3.2%
Recessed Lighting-Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Table lamps	34.3%	6.1%	2.6%	1.8%	-	-	-	-	-	-	1.8%	1.7%	30.7%	5.9%
Torchiere	1.4%	1.4%	-	-	-	-	-	-	-	-	0.5%	0.6%	0.9%	1.2%
Wall Mount	1.0%	1.1%	-	-	-	-	-	-	-	-	0.6%	1.0%	0.4%	0.5%

Table 5: Percentage of Homes with Fixture Type and Lamp Type in Bedroom 3

Fixture Type (n=50)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	8.4%	7.8%	-	-	-	-	-	-	4.4%	4.3%	94.6%	6.4%
Ceiling Fan	7.3%	5.7%	-	-	-	-	-	-	-	-	-	-	7.3%	5.7%
Ceiling Fixtures	80.0%	9.6%	6.6%	7.4%	-	-	-	-	-	-	-	-	73.4%	11.2%
Chandelier Hanging	1.8%	2.9%	-	-	-	-	-	-	-	-	-	-	1.8%	2.9%
Floor Lamp	5.0%	5.0%	-	-	-	-	-	-	-	-	-	-	5.0%	5.0%
Recessed Can	14.8%	9.1%	-	-	-	-	-	-	-	1.8%	2.9%	13.0%	8.7%	
Table lamps	42.4%	12.9%	-	-	-	-	-	-	-	1.8%	2.9%	40.6%	12.9%	
Torchiere	0.8%	1.3%	-	-	-	-	-	-	-	0.8%	1.3%	-	-	
Wall Mount	3.8%	4.3%	1.8%	2.9%	-	-	-	-	-	-	-	-	2.0%	3.2%

Table 6: Percentage of Homes with Fixture Type and Lamp Type in Bedroom 4Living Room

Table 7 presents the percentage of homes with a given fixture type and lamp type in the living room, along with the error bounds associated with these estimates. The most commonly found fixture and lamp type combinations are ceiling fans, floor lamps, recessed can and table lamps with incandescent lamps, as well as table lamps with compact fluorescent lamps.

Fixture Type (n=512)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	21.5%	3.8%	0.1%	0.1%	0.1%	0.1%	1.5%	1.0%	14.7%	3.4%	91.5%	2.9%
Architecturally Integrated	3.4%	1.4%	-	-	-	-	0.1%	0.1%	-	-	0.9%	0.7%	2.4%	1.3%
Ceiling Fan	31.6%	3.8%	1.1%	0.8%	-	-	-	-	-	-	-	-	30.9%	3.8%
Ceiling Fixtures	14.4%	2.8%	1.5%	1.0%	-	-	-	-	-	-	1.0%	0.8%	11.9%	2.6%
Chandelier Hanging	11.0%	3.2%	-	-	-	-	-	-	-	-	0.5%	0.6%	10.5%	3.1%
Floor Lamp	29.8%	3.7%	5.6%	1.7%	-	-	-	-	0.6%	0.7%	2.7%	1.3%	22.2%	3.3%
Other	0.2%	0.2%	-	-	-	-	-	-	-	-	0.1%	0.2%	0.1%	0.1%
Recessed Can	43.3%	4.3%	3.3%	1.7%	-	-	-	-	-	-	5.5%	2.7%	36.4%	4.1%
Recessed Lighting-Other	3.6%	1.5%	-	-	-	-	-	-	-	-	0.9%	0.9%	2.7%	1.2%
Table lamps	47.0%	4.3%	11.5%	3.2%	-	-	-	-	0.3%	0.5%	1.0%	0.8%	38.2%	4.2%
Torchiere	8.7%	2.3%	2.0%	1.2%	-	-	-	-	0.8%	0.7%	2.7%	1.2%	3.3%	1.4%
Track Lighting	2.4%	1.5%	-	-	-	-	-	-	-	-	0.8%	0.7%	1.7%	1.3%
Under Counter	0.3%	0.3%	-	-	0.1%	0.1%	-	-	-	-	-	-	0.2%	0.3%
Wall Mount	8.6%	2.2%	0.9%	0.7%	-	-	-	-	0.1%	0.1%	0.7%	0.7%	7.0%	2.0%

Table 7: Percentage of Homes with Fixture Type and Lamp Type in Living RoomBathrooms

Table 8, Table 9, Table 10, and Table 11 present the percentage of homes with a given fixture type and lamp type in bathrooms and the error bounds associated with these estimates. The most commonly found fixture and lamp type combinations are ceiling mounts, wall mounts, and recessed cans with incandescent lamps, as well as ceiling mounts with compact fluorescent lamps.

Fixture Type (n=604)	Lamp Type														
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent		
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	
Overall	-	-	8.7%	2.2%	0.1%	0.1%	0.1%	0.2%	0.1%	0.2%	8.5%	2.6%	96.2%	1.5%	
Architecturally Integrated	0.3%	0.4%	-	-	-	-	-	-	-	-	-	-	-	0.3%	0.4%
Ceiling Fan	0.6%	0.5%	-	-	-	-	-	-	-	-	-	-	-	0.6%	0.5%
Ceiling Fixtures	35.6%	3.8%	2.6%	1.2%	0.1%	0.1%	0.1%	0.2%	0.1%	0.2%	1.1%	1.8%	33.0%	3.7%	
Chandelier Hanging	1.1%	0.8%	-	-	-	-	-	-	-	-	0.1%	0.2%	0.9%	0.7%	
Other	3.0%	2.0%	-	-	-	-	-	-	-	-	-	-	-	3.0%	2.0%
Recessed Can	46.2%	3.9%	2.5%	1.3%	-	-	-	-	-	-	3.6%	1.4%	41.7%	3.8%	
Recessed Lighting-Other	16.8%	3.0%	0.3%	0.4%	-	-	-	-	-	-	0.5%	0.6%	16.1%	2.9%	
Table lamps	1.2%	0.7%	0.2%	0.3%	-	-	-	-	-	-	-	-	-	1.0%	0.7%
Wall Mount	91.5%	2.1%	6.2%	1.9%	-	-	-	-	-	-	3.4%	1.4%	83.4%	2.8%	

Table 8: Percentage of Homes with Fixture Type and Lamp Type in Master Bathroom

Fixture Type (n=569)	Lamp Type														
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent		
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	
Overall	-	-	6.2%	2.0%	-	-	-	-	-	-	3.9%	1.6%	94.4%	1.9%	
Architecturally Integrated	0.2%	0.4%	-	-	-	-	-	-	-	-	-	-	-	0.2%	0.4%
Ceiling Fan	0.3%	0.3%	-	-	-	-	-	-	-	-	-	-	-	0.3%	0.3%
Ceiling Fixtures	15.6%	3.1%	1.0%	0.8%	-	-	-	-	-	-	-	-	-	14.6%	3.1%
Chandelier Hanging	0.2%	0.2%	-	-	-	-	-	-	-	-	0.1%	0.1%	0.1%	0.2%	
Floor Lamp	0.1%	0.1%	-	-	-	-	-	-	-	-	-	-	-	0.1%	0.1%
Other	2.1%	1.1%	-	-	-	-	-	-	-	-	-	-	-	2.1%	1.1%
Recessed Can	11.0%	2.4%	1.2%	1.1%	-	-	-	-	-	-	0.9%	0.9%	9.0%	2.1%	
Recessed Lighting-Other	10.1%	2.4%	0.2%	0.3%	-	-	-	-	-	-	0.3%	0.4%	9.6%	2.4%	
Table lamps	1.3%	0.8%	0.1%	0.2%	-	-	-	-	-	-	0.1%	0.2%	1.0%	0.7%	
Wall Mount	93.3%	1.9%	4.0%	1.5%	-	-	-	-	-	-	2.6%	1.2%	86.9%	2.6%	

Table 9: Percentage of Homes with Fixture Type and Lamp Type in Bathroom 1

Fixture Type (n=355)	Lamp Type														
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent		
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	
Overall	-	-	8.3%	2.9%	-	-	-	-	0.3%	0.3%	5.0%	2.2%	92.3%	2.6%	
Ceiling Fixtures	17.5%	5.0%	2.5%	1.9%	-	-	-	-	0.1%	0.2%	-	-	14.9%	4.8%	
Chandelier Hanging	0.5%	0.5%	-	-	-	-	-	-	-	-	-	-	-	0.5%	0.5%
Other	1.4%	0.9%	-	-	-	-	-	-	0.2%	0.3%	-	-	-	1.3%	0.8%
Recessed Can	15.3%	3.8%	1.6%	1.6%	-	-	-	-	-	-	0.9%	1.0%	12.8%	3.4%	
Recessed Lighting-Other	9.2%	3.1%	-	-	-	-	-	-	-	-	0.4%	0.7%	8.7%	3.0%	
Table lamps	1.0%	1.0%	-	-	-	-	-	-	-	-	-	-	-	1.0%	1.0%
Wall Mount	95.2%	1.9%	6.7%	2.6%	-	-	-	-	-	-	3.6%	1.8%	87.0%	3.2%	

Table 10: Percentage of Homes with Fixture Type and Lamp Type in Bathroom 2

Fixture Type (n=88)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	14.4%	7.7%	-	-	-	-	1.0%	1.6%	1.7%	1.8%	89.7%	6.9%
Architecturally Integrated	0.4%	0.7%	-	-	-	-	-	-	-	-	0.4%	0.7%	-	-
Ceiling Fixtures	38.4%	11.5%	4.2%	4.1%	-	-	-	-	1.0%	1.6%	0.9%	1.5%	32.3%	11.6%
Chandelier Hanging	0.5%	0.8%	-	-	-	-	-	-	-	-	-	-	0.5%	0.8%
Other	2.9%	2.4%	-	-	-	-	-	-	-	-	-	-	2.9%	2.4%
Recessed Can	21.1%	8.8%	6.8%	6.2%	-	-	-	-	-	-	-	-	14.2%	7.0%
Recessed Lighting-Other	8.9%	5.8%	-	-	-	-	-	-	-	-	-	-	8.9%	5.8%
Table lamps	2.0%	2.6%	-	-	-	-	-	-	-	-	-	-	2.0%	2.6%
Wall Mount	79.2%	7.7%	10.8%	7.0%	-	-	-	-	-	-	0.4%	0.7%	67.9%	9.7%

Table 11: Percentage of Homes with Fixture Type and Lamp Type in Bathroom 3

Halls

Table 12 presents the percentage of homes with a given fixture type and lamp type in hallways and the error bounds associated with these estimates. The most commonly found fixture and lamp type combinations are ceiling mounts, chandelier/hanging fixtures, recessed cans and wall mounts with incandescent lamps. Ceiling mounts with compact fluorescent lamps were the next most common fixture-lamp combination.

Fixture Type (n=598)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	11.9%	2.5%	1.1%	0.8%	0.2%	0.2%	0.6%	0.6%	8.6%	2.2%	95.3%	1.7%
Architecturally Integrated	2.9%	1.3%	-	-	-	-	-	-	0.3%	0.4%	0.5%	0.5%	2.2%	1.1%
Ceiling Fan	0.8%	0.6%	-	-	-	-	-	-	-	-	-	-	0.8%	0.6%
Ceiling Fixtures	69.4%	3.5%	5.7%	1.8%	0.8%	0.7%	-	-	0.5%	0.5%	1.5%	0.9%	64.5%	3.7%
Chandelier Hanging	45.1%	3.9%	2.6%	1.4%	-	-	-	-	-	-	0.6%	0.6%	42.0%	3.9%
Floor Lamp	0.8%	0.6%	0.1%	0.1%	-	-	-	-	-	-	-	-	0.7%	0.6%
Other	1.2%	1.9%	-	-	-	-	-	-	0.1%	0.2%	-	-	1.1%	1.8%
Recessed Can	47.9%	3.9%	4.7%	1.7%	-	-	-	-	-	-	4.1%	1.6%	42.7%	3.9%
Recessed Lighting-Other	1.2%	0.8%	0.2%	0.4%	-	-	-	-	-	-	0.3%	0.4%	0.7%	0.5%
Table lamps	5.2%	1.6%	0.5%	0.4%	-	-	-	-	-	-	0.3%	0.4%	4.5%	1.6%
Torchiere	0.5%	0.5%	0.1%	0.2%	-	-	-	-	-	-	0.3%	0.4%	0.1%	0.2%
Track Lighting	0.9%	0.9%	-	-	-	-	-	-	-	-	0.4%	0.5%	0.5%	0.8%
Under Counter	0.8%	0.6%	-	-	0.2%	0.4%	0.2%	0.2%	-	-	0.4%	0.4%	-	-
Wall Mount	26.0%	3.3%	2.8%	1.3%	-	-	-	-	-	-	2.0%	1.1%	22.2%	3.1%

Table 12: Percentage of Homes with Fixture Type and Lamp Type in Hallway

Dining Room

Table 13 presents the percentage of homes with a given fixture type and lamp type in dining rooms as well as the error bounds associated with these estimates. The most commonly found fixture and lamp type combinations are chandelier/hanging fixtures and recessed cans with incandescent bulbs. Chandelier/Hanging with compact fluorescent lamps were the next most common fixture-lamp combination.

Fixture Type (n=479)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	10.0%	2.7%	0.3%	0.5%	-	-	-	-	5.5%	2.0%	92.5%	2.3%
Architecturally Integrated	3.8%	1.7%	-	-	-	-	-	-	-	-	1.0%	0.8%	2.9%	1.5%
Ceiling Fan	1.6%	1.0%	-	-	-	-	-	-	-	-	0.3%	0.5%	1.3%	0.9%
Ceiling Fixtures	6.0%	2.2%	1.0%	0.9%	-	-	-	-	-	-	0.3%	0.6%	4.7%	1.9%
Chandelier Hanging	88.7%	2.7%	6.0%	2.1%	-	-	-	-	-	-	1.0%	0.8%	82.7%	3.2%
Floor Lamp	3.2%	1.5%	0.7%	0.8%	-	-	-	-	-	-	0.4%	0.4%	2.3%	1.2%
Garage Door Opener	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	2.0%	2.4%	-	-	-	-	-	-	-	-	-	-	2.0%	2.4%
Recessed Can	14.8%	3.1%	1.8%	1.4%	-	-	-	-	-	-	2.5%	1.4%	10.9%	2.6%
Recessed Lighting-Other	1.1%	1.1%	0.6%	1.0%	-	-	-	-	-	-	-	-	0.5%	0.4%
Table lamps	4.8%	1.7%	0.6%	0.6%	-	-	-	-	-	-	-	-	4.5%	1.7%
Torchiere	0.3%	0.5%	-	-	-	-	-	-	-	-	0.3%	0.5%	-	-
Track Lighting	0.1%	0.2%	-	-	-	-	-	-	-	-	-	-	0.1%	0.2%
Wall Mount	3.9%	1.7%	0.9%	1.1%	0.3%	0.5%	-	-	-	-	0.2%	0.3%	2.5%	1.3%

Table 13: Percentage of Homes with Fixture Type and Lamp Type in Dining Room

Breakfast Nook

Table 14 presents the percentage of homes with a given fixture type and lamp type in breakfast nooks along with the error bounds associated with these estimates. Similar to dining rooms, the most commonly found fixture and lamp type combinations are chandelier/hanging fixtures, recessed cans, and ceiling fixtures with incandescent bulbs. Chandelier/Hanging fixtures with compact fluorescent lamps were the next most common fixture-lamp combination.

Fixture Type (n=194)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	9.8%	3.8%	-	-	-	-	0.2%	0.4%	2.9%	1.9%	89.4%	3.8%
Ceiling Fan	4.9%	2.8%	-	-	-	-	-	-	-	-	-	-	4.9%	2.8%
Ceiling Fixtures	8.6%	3.5%	1.3%	1.5%	-	-	-	-	-	-	-	-	7.3%	3.2%
Chandelier Hanging	72.6%	5.8%	6.6%	3.1%	-	-	-	-	0.2%	0.4%	1.8%	1.5%	64.4%	6.2%
Recessed Can	17.8%	5.1%	1.8%	1.7%	-	-	-	-	-	-	1.1%	1.3%	14.9%	4.8%
Recessed Lighting-Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Table lamps	1.4%	1.4%	0.4%	0.7%	-	-	-	-	-	-	-	-	1.0%	1.3%
Wall Mount	1.4%	1.3%	-	-	-	-	-	-	-	-	-	-	1.4%	1.3%

Table 14: Percentage of Homes with Fixture Type and Lamp Type in Breakfast Nook

Home Office

Table 15 presents the percentage of homes with a given fixture type and lamp type in home offices and the error bounds associated with these estimates. The most commonly found fixture and lamp type combinations are ceiling fans, ceiling mount, recessed can, floor lamps, and table lamps with incandescent bulbs.

Fixture Type (n=328)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	15.2%	3.7%	0.6%	0.7%	1.6%	1.2%	1.8%	1.4%	15.7%	3.6%	88.8%	3.2%
Architecturally Integrated	0.7%	0.8%	-	-	-	-	-	-	-	-	0.7%	0.8%	0.3%	0.5%
Ceiling Fan	10.3%	2.9%	0.5%	0.6%	-	-	-	-	-	-	0.2%	0.4%	9.6%	2.9%
Ceiling Fixtures	59.7%	5.1%	4.1%	1.8%	0.1%	0.2%	1.6%	1.2%	-	-	1.8%	1.3%	52.2%	5.2%
Chandelier Hanging	8.4%	2.8%	0.5%	0.6%	-	-	-	-	-	-	-	-	7.9%	2.8%
Floor Lamp	10.9%	3.1%	2.1%	1.4%	-	-	-	-	-	-	-	-	8.9%	2.8%
Recessed Can	23.5%	4.4%	2.5%	1.9%	-	-	-	-	-	-	2.9%	1.8%	19.0%	3.9%
Recessed Lighting-Other	1.2%	1.0%	-	-	-	-	-	-	-	-	0.4%	0.7%	0.7%	0.7%
Table lamps	38.1%	4.9%	6.3%	2.5%	0.1%	0.2%	-	-	1.3%	1.3%	6.8%	2.5%	26.4%	4.4%
Torchiere	3.4%	1.7%	0.1%	0.2%	-	-	-	-	-	-	2.7%	1.6%	0.5%	0.6%
Track Lighting	2.4%	1.8%	0.8%	1.4%	-	-	-	-	-	-	0.9%	0.8%	0.7%	0.8%
Under Counter	1.7%	1.3%	-	-	0.4%	0.7%	-	-	0.4%	0.5%	0.4%	0.7%	0.4%	0.6%
Wall Mount	4.2%	1.9%	0.4%	0.6%	-	-	-	-	-	-	0.4%	0.7%	3.4%	1.7%

Table 15: Percentage of Homes with Fixture Type and Lamp Type in Home Office

Laundry Room

Table 16 presents the percentage of homes with a given fixture type and lamp type in laundry rooms along with the error bounds associated with these estimates. The most predominant fixture and lamp type combinations are ceiling mounts and recessed cans with incandescent. Ceiling mounts with compact fluorescent lamps were the next most common fixture-lamp combination.

Fixture Type (n=546)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	8.0%	2.3%	2.8%	1.5%	11.6%	3.0%	3.5%	1.4%	1.8%	1.1%	74.6%	3.7%
Architecturally Integrated	0.4%	0.4%	-	-	-	-	-	-	0.1%	0.1%	0.1%	0.1%	0.2%	0.4%
Ceiling Fan	0.2%	0.2%	0.1%	0.1%	-	-	-	-	-	-	-	-	0.1%	0.1%
Ceiling Fixtures	89.3%	2.6%	6.7%	2.1%	2.5%	1.4%	11.1%	2.9%	3.1%	1.3%	0.8%	0.7%	65.7%	4.0%
Chandelier Hanging	0.4%	0.5%	0.1%	0.2%	-	-	-	-	-	-	-	-	0.3%	0.5%
Floor Lamp	0.1%	0.2%	0.1%	0.2%	-	-	-	-	-	-	-	-	-	-
Recessed Can	9.9%	2.5%	1.1%	0.9%	-	-	-	-	-	-	0.4%	0.5%	8.4%	2.3%
Recessed Lighting-Other	1.2%	0.9%	-	-	-	-	-	-	-	-	0.3%	0.5%	0.9%	0.8%
Table lamps	1.0%	0.7%	-	-	-	-	-	-	-	-	-	-	1.0%	0.7%
Torchiere	0.1%	0.2%	0.1%	0.2%	-	-	-	-	-	-	-	-	-	-
Track Lighting	0.3%	0.5%	-	-	-	-	-	-	-	-	0.3%	0.5%	-	-
Under Counter	0.9%	0.8%	-	-	-	-	0.6%	0.7%	0.3%	0.4%	-	-	-	-
Wall Mount	2.4%	1.2%	0.3%	0.4%	0.3%	0.5%	0.4%	0.5%	0.2%	0.2%	-	-	1.3%	0.9%

Table 16: Percentage of Homes with Fixture Type and Lamp Type in Laundry Room

Closets

Table 17 presents the percentage of homes with a given fixture type and lamp type in closets and the error bounds associated with these estimates. The most commonly found fixture and lamp type combinations are ceiling mounts with incandescent bulbs and ceiling mounts with CFLs.

Fixture Type (n=510)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	9.2%	2.5%	5.0%	1.9%	13.0%	3.2%	4.0%	1.7%	1.5%	1.0%	81.2%	3.2%
Ceiling Fixtures	94.1%	2.0%	8.2%	2.4%	3.4%	1.6%	9.2%	2.9%	2.7%	1.5%	0.5%	0.5%	75.0%	3.6%
Chandelier Hanging	0.7%	0.9%	-	-	-	-	-	-	-	-	-	-	0.7%	0.9%
Floor Lamp	0.3%	0.4%	-	-	-	-	-	-	-	-	-	-	0.3%	0.4%
Garage Door Opener	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	0.1%	0.2%	-	-	-	-	-	-	-	-	-	-	0.1%	0.2%
Recessed Can	6.1%	2.0%	0.5%	0.6%	0.1%	0.1%	-	-	-	-	0.3%	0.5%	5.2%	1.8%
Recessed Lighting-Other	0.7%	0.7%	-	-	-	-	-	-	-	-	0.4%	0.5%	0.3%	0.5%
Table lamps	0.2%	0.3%	-	-	-	-	-	-	-	-	-	-	0.2%	0.3%
Track Lighting	0.4%	0.5%	-	-	-	-	-	-	-	-	0.4%	0.5%	-	-
Under Counter	0.4%	0.4%	-	-	0.2%	0.3%	-	-	0.2%	0.3%	-	-	-	-
Wall Mount	13.2%	2.8%	0.6%	0.6%	1.6%	1.2%	5.1%	1.9%	1.1%	0.9%	0.3%	0.5%	6.7%	1.9%

Table 17: Percentage of Homes with Fixture Type and Lamp Type in Closets

Garage

Table 18 presents the percentage of homes with a given fixture type and lamp type in garages along with the error bounds associated with these estimates. The most predominant fixture and lamp type combinations are ceiling mounts, garage door opener, and wall mounts with incandescent lamps. In addition, ceiling mounts are also common with compact fluorescent and T12.

Fixture Type (n=543)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent-Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	14.8%	3.3%	7.2%	2.2%	15.6%	2.9%	2.2%	1.0%	1.2%	0.7%	93.9%	1.9%
Architecturally Integrated	0.2%	0.2%	-	-	-	-	-	-	-	-	-	-	0.2%	0.2%
Ceiling Fan	1.3%	1.1%	0.7%	0.8%	-	-	0.5%	0.6%	-	-	-	-	0.1%	0.2%
Ceiling Fixtures	97.3%	1.1%	12.1%	3.1%	7.2%	2.2%	14.3%	2.8%	2.2%	1.0%	0.1%	0.1%	68.7%	4.0%
Chandelier Hanging	1.8%	1.0%	-	-	-	-	1.1%	0.8%	-	-	-	-	0.7%	0.6%
Floor Lamp	0.1%	0.1%	-	-	-	-	-	-	-	-	-	-	0.1%	0.1%
Garage Door Opener	82.5%	2.9%	2.3%	1.2%	-	-	-	-	-	-	-	-	80.3%	3.1%
Other	0.6%	0.6%	-	-	-	-	-	-	-	-	0.3%	0.4%	0.3%	0.4%
Recessed Can	2.4%	1.0%	0.4%	0.5%	-	-	-	-	-	-	0.6%	0.5%	1.3%	0.8%
Recessed Lighting-Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Table lamps	0.4%	0.4%	0.1%	0.1%	-	-	-	-	-	-	0.1%	0.1%	0.3%	0.4%
Track Lighting	0.7%	0.6%	-	-	-	-	-	-	-	-	-	-	0.7%	0.6%
Under Counter	0.3%	0.5%	-	-	-	-	0.3%	0.5%	-	-	-	-	-	-
Wall Mount	9.6%	1.7%	0.7%	0.5%	-	-	-	-	-	-	0.2%	0.3%	9.0%	1.7%

Table 18: Percentage of Homes with Fixture Type and Lamp Type in Garage

All Other Rooms

Table 19 presents the percentage of homes with a given fixture type and lamp type in all rooms other than the types previously mentioned as well as the error bounds associated with these estimates. The Other room type includes attics, bars, exercise rooms, music rooms, sewing rooms, as well as pool houses. The most predominant fixture and lamp type combinations are ceiling mounts, recessed cans, wall mounts with incandescent lamps, and ceiling fixtures with CFLs.

Fixture Type (n=180)	Lamp Type													
	Overall		Compact Fluorescent		Fluorescent T8		Fluorescent T12		Fluorescent- Other Tube		Halogen		Incandescent	
	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB	% of Homes	EB
Overall	-	-	11.6%	4.5%	10.3%	7.6%	6.3%	3.3%	1.9%	2.5%	4.9%	2.9%	80.9%	7.9%
Architecturally Integrated	1.9%	2.3%	-	-	-	-	-	-	-	-	0.3%	0.5%	1.6%	2.2%
Ceiling Fan	1.8%	1.7%	-	-	-	-	1.0%	1.6%	-	-	-	-	0.8%	0.8%
Ceiling Fixtures	63.3%	7.1%	3.3%	2.5%	9.3%	7.6%	4.1%	2.7%	1.9%	2.5%	-	-	48.9%	7.7%
Chandelier Hanging	4.2%	2.8%	-	-	-	-	-	-	-	-	-	-	4.2%	2.8%
Floor Lamp	1.2%	1.0%	0.3%	0.5%	-	-	-	-	-	-	-	-	0.9%	0.8%
Other	8.6%	3.4%	0.7%	1.2%	-	-	0.3%	0.5%	-	-	0.3%	0.5%	7.3%	3.2%
Recessed Can	16.3%	5.6%	3.2%	2.6%	-	-	-	-	-	-	0.8%	1.0%	12.3%	5.0%
Table lamps	8.7%	3.6%	2.7%	2.1%	-	-	-	-	-	-	-	-	6.0%	2.9%
Torchiere	0.9%	1.5%	-	-	-	-	-	-	-	-	0.9%	1.5%	-	-
Track Lighting	1.4%	1.7%	-	-	-	-	-	-	-	-	1.4%	1.7%	-	-
Wall Mount	26.0%	5.8%	2.5%	1.8%	1.0%	1.6%	1.0%	1.3%	-	-	1.2%	1.5%	20.9%	5.1%

Table 19: Percentage of Homes with Fixture Type and Lamp Type in Other Room Type

Porch Lighting

Table 20 presents the percentage of homes utilizing each lamp type for the porch light. Approximately 66% of all homes are using a standard incandescent lamp for the porch light. More than 12% of homes are using a compact fluorescent lamp.

Lamp Type	Percentage of Homes (n=527)	EB
Compact Fluorescent A Style	0.7%	0.6%
Compact Fluorescent Capsule	0.1%	0.1%
Compact Fluorescent Circline	-	-
Compact Fluorescent Decorative	-	-
Compact Fluorescent Flood	4.9%	2.6%
Compact Fluorescent Globe	0.3%	0.3%
Compact Fluorescent Spring	4.4%	1.6%
Compact Fluorescent Tubular	1.0%	0.8%
Compact Fluorescent Unknown	-	-
Compact Fluorescent Mini	1.3%	1.0%
Compact Fluorescent Pin Base	0.3%	0.4%
Compact Fluorescent Total	12.2%	3.2%
Fluorescent T12	-	-
Fluorescent T4	-	-
Fluorescent T5	-	-
Fluorescent T8	-	-
Fluorescent Circline	-	-
Fluorescent Other	-	-
Fluorescent Tube Unknown	0.1%	0.2%
Fluorescent Total	0.2%	0.2%
MR-16 Pin Based Halogen	0.3%	0.5%
Halogen Other	0.6%	0.5%
Halogen Parabolic Reflector	2.3%	1.3%
Halogen Quartz Tube	0.7%	0.7%
Halogen Unknown	1.6%	1.0%
Halogen Total	4.7%	1.7%
Heat Lamp	-	-
Decorative Incandescent	6.7%	1.9%
Incandescent Flood	42.0%	4.2%
Incandescent Globe	0.9%	0.7%
Incandescent Mini	1.5%	0.9%
Incandescent Other	0.1%	0.1%
Incandescent Standard	65.6%	4.2%
Incandescent Unknown	0.2%	0.2%
Incandescent Total	90.8%	3.0%

Table 20: Percentage of Homes Having Lamp Type as Porch Light